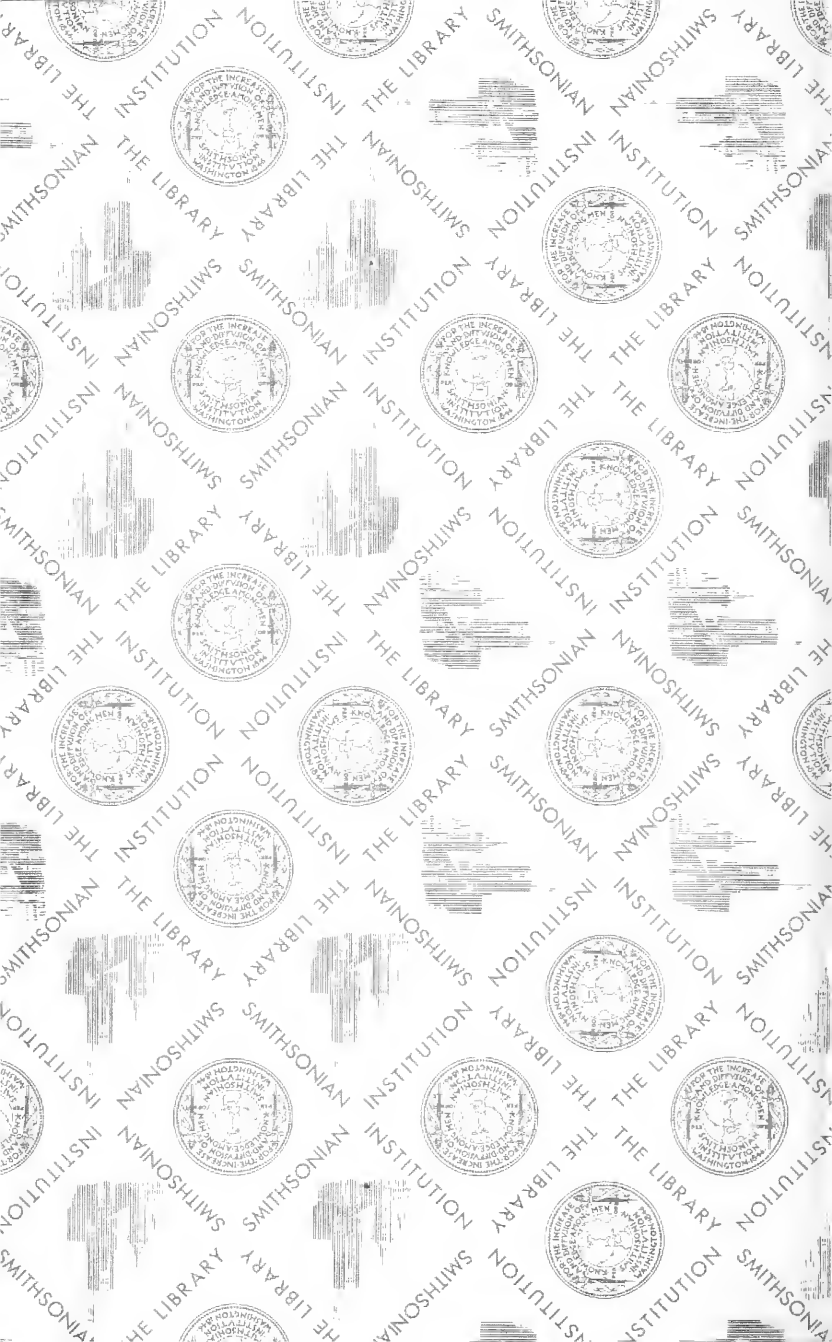


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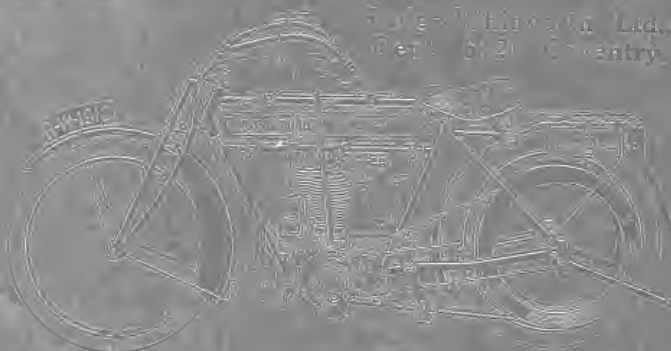
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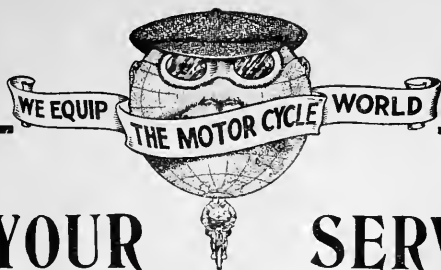
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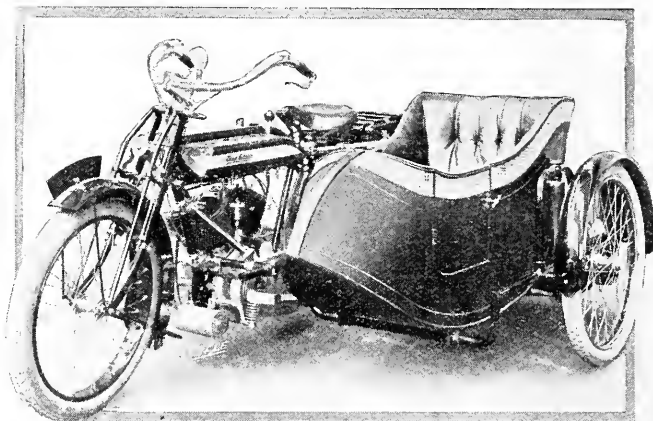
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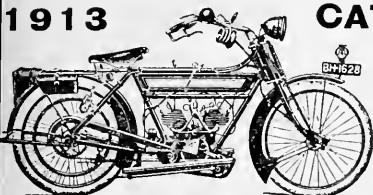
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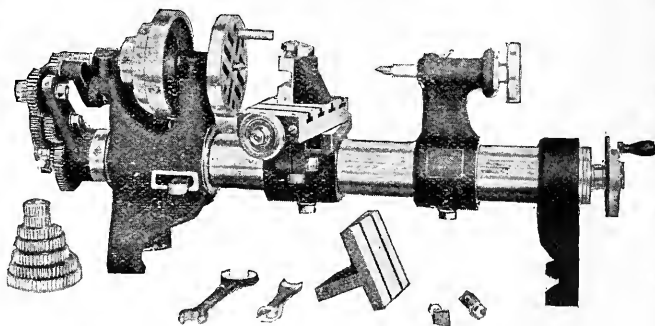
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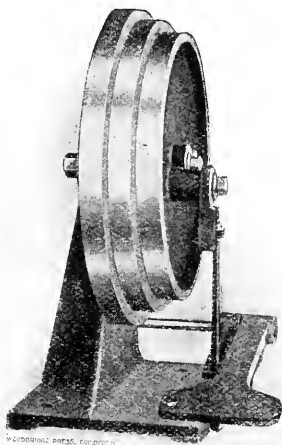
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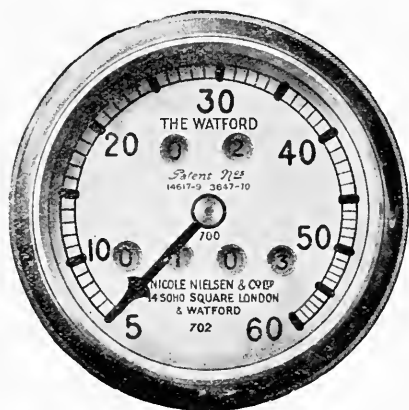
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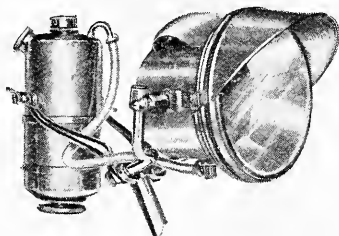
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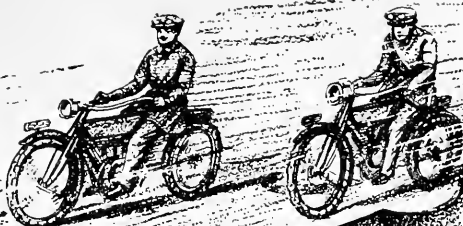
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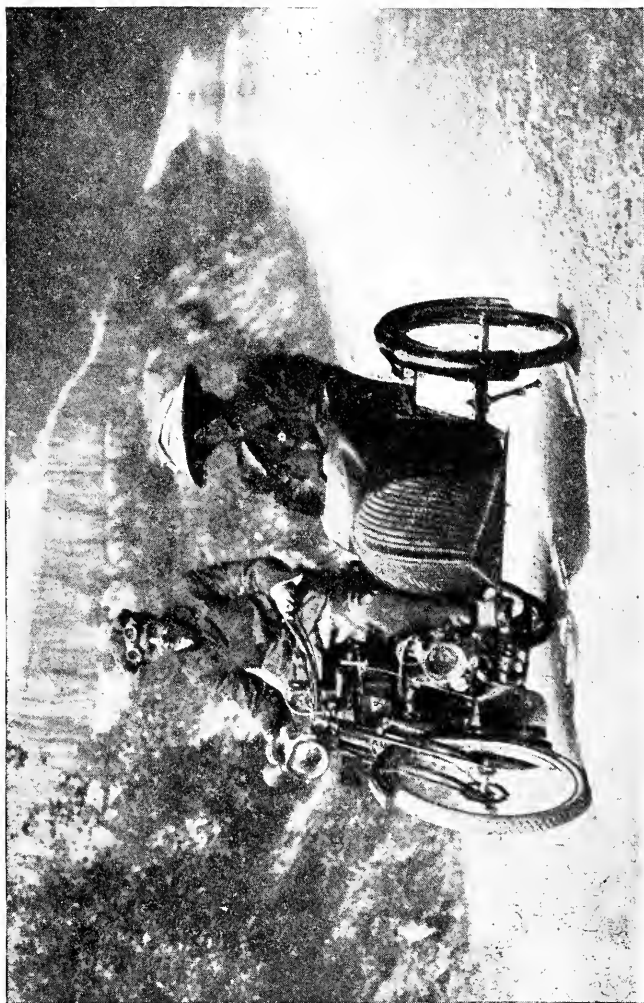
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HOW TO DRIVE A MOTOR CYCLE

A POPULAR EXPLANATION OF THE HANDLING AND
MANAGEMENT OF A MOTOR BICYCLE ON THE ROAD
AND AT HOME.

By "PHŒNIX"
(CHAS. S. LAKE),

Author of *The Motor Cyclist's Handbook*, and writer of the
"Motor Cycle Notes" appearing weekly in *The Model Engineer*.

Illustrated by SPECIAL PHOTOGRAPHS AND DRAWINGS.



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PREFACE.

THIS little volume does not pretend to be anything more than its title implies—namely, a guide to those who, having possessed themselves of a motor cycle, and being entirely without experience, now require to know how to drive it.

Such matters as the construction of the engine and its appurtenances and the principles upon which they severally and collectively operate, do not come within the present scope, and it is assumed that the reader has already made himself acquainted with these points by studying “The Motor Cyclist’s Handbook,” published under the same auspices, and in which will be found all the information that can be required on the subject of the design and working of the modern motor cycle.

It is unquestionably the fact that one may school himself into the possession of a very fair knowledge of these latter points, and yet be at a loss when it comes to actual handling of the mechanism on the road, just as a man may quite well understand the construction of a steamship, for instance, and still not be able to navigate one on the high seas. And, further, it is quite possible to get about on a motor bicycle and derive a fair amount of satisfaction from it, while at the same time falling far short of being a really

good driver or one who obtains anything like the best results from his engine.

It is, then, with the handling of the machine on the road that we are concerned on this occasion, and in the pages which follow the author's endeavour has been to provide such information as will enable the motor-cycling novice to quickly master his machine and learn how to drive and control it to the best advantage.

“PHŒNIX.”

How to Drive a Motor Cycle.

BY "PHŒNIX,"

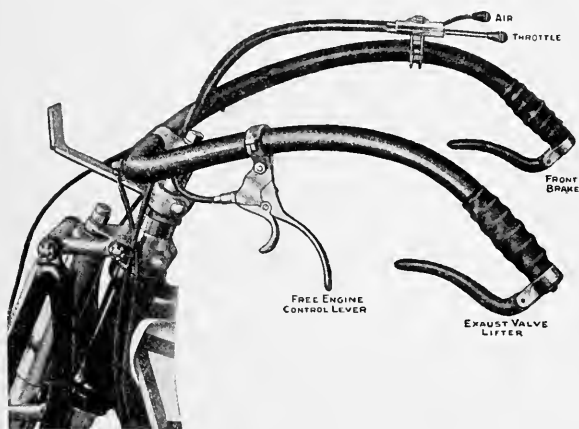
Author of "The Motor Cyclist's Handbook," and contributor of the "Motor Cycle Notes" appearing weekly in *The Model Engineer and Electrician*.

CHAPTER I.

DELIVERY OF THE NEW MACHINE ; NEED FOR EXAMINATION BEFORE USE ; PRELIMINARIES TO STARTING THE ENGINE ; METHODS OF STARTING ; LEGAL OBLIGATIONS ATTENDING THE USE OF A MOTOR CYCLE.

Acquisition of the Machine.

It is not necessary to enter here into any question affecting the choice of the motor bicycle, and what its horse-power and



Handlebar of a Modern Motor Bicycle with Control Levers.

other characteristics should be to perform the work its owner will require of it. The author's purpose is to begin where such considerations cease, and to take up the subject at the point where the delivery of the new machine has either been

actually effected, or is a matter hourly anticipated and much longed for. It is a proud moment with the motor cycling beginner when the railway van or other conveyance at last deposits his splendid purchase at the door, and the visions of prospective outings which have been indulged in, perhaps for months past, are at length to be removed from the region of imagination to that of almost immediate realisation.

It is very important, however, that the wholly inexperienced owner of a motor bicycle should go carefully and systematically to work before he ventures abroad on his newly-acquired mount; and even those who are not altogether novices are well advised if, before taking the machine out on the road, they make a careful scrutiny of its many parts, testing each of the more vital nuts with a spanner, especially those which hold the handle-bars and saddle-pin tightly in place, and also the axle nuts of each wheel. The majority of motor cyclists are recruited from the ranks of pedal cyclists, and the fitting nature of these remarks will, therefore, not be lost upon them.

It is not to be expected that the novice who is entirely without experience will be able to detect any want of adjustment which may be present in the engine itself or any of its adjuncts, and if the machine is an entirely new one, straight from the maker's works or from the agent's dépôt, it is highly improbable that any of the parts will require attention. Even though they may do so, it is not always easy to discover the fact until after a trial on the road, when some slight thing or other may have occurred to denote it.

First Steps for the Beginner.

When the machine has been uncased and stripped of its wrappings, the first thing to be done is to get the back wheel jacked up on the stand and the driving belt mounted on the pulleys. Care should be taken in performing the first-named operation, to let the machine come back gently on the stand, and not, as so many do, allow it, directly the legs of the stand begin to take the weight, to fall of its own accord the rest of the distance—that is, until the lower member of the frame comes into contact with the projection on the legs (see Fig. 1, at A). This practice results very often in a broken stand, or, at least, one that is strained and does not hold the wheel upright or wholly clear of the ground.

The belt is delivered fitted with its fastener, and cut to the right length. With the wheel jacked up and the exhaust lifter (on the left handlebar) raised, and, perhaps, the cylinder compression cock opened as well, pass the belt round the



" JACKING UP."

When lifting the machine on to the stand be careful to let it come back gently, otherwise the legs of the stand may be strained or broken.

engine pulley, and also round the top portion of the rim on the back wheel, making sure that it is passed *inside* the leg of the stand, the carrier arms, and back stays, and not permitting it to encircle the belt rim until actually being stretched into place. Then couple up the fastener, and, with the exhaust lifter still raised (it may be tied up or held by means of a clip to the handlebar, if desired), pull the wheel round backwards, when the belt will be forced on to the rim, and, having already been mounted on the engine pulley, will now be in its proper position for driving. It is a good plan to revolve the wheel once after the belt has been mounted in place, to make sure that it is on quite fair—that is to say, not twisted or otherwise wrongly adjusted. The belt should be tensioned fairly tightly to begin with, and, if found either too tight or too loose, it can be corrected, as a rule, by means

of the adjustable pulley, although subsequent shortenings must be effected by taking a piece out and reconnecting one-half of the fastener. Another method of putting on the belt

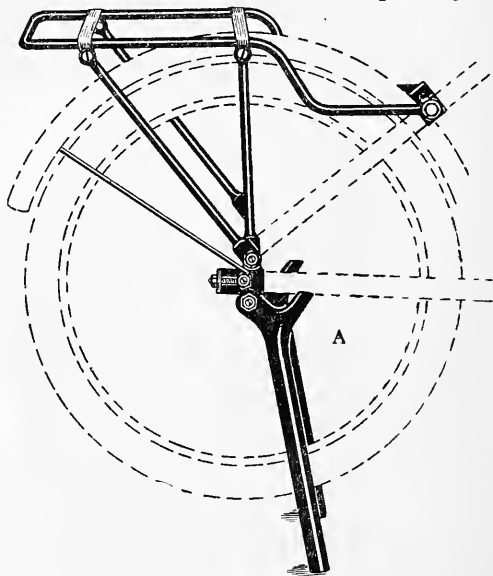


Fig. 1.—Carrier and Stand for Motor Bicycle.

is to wheel the machine backwards instead of jacking up on the stand and turning the wheel by hand.

How to Manipulate the Levers.

Having made sure, then, that everything is secure, the next step is to make oneself acquainted with the manipulation of the various levers, and to discover, by running the engine with the back wheel clear of the ground, what effects are produced thereby. Supplies of petrol and engine lubricating oil having been placed in their respective tanks, the tap controlling the flow of petrol from the tank to the carburettor should be turned on, and the spring plunger on the float chamber of the carburettor pressed down until petrol overflows. This "flooding," as it is called, should not be overdone, as it not only wastes petrol, but may even make the starting of the engine a difficult matter owing to the mixture becoming too rich, *i.e.*, overcharged with petrol, to be fired

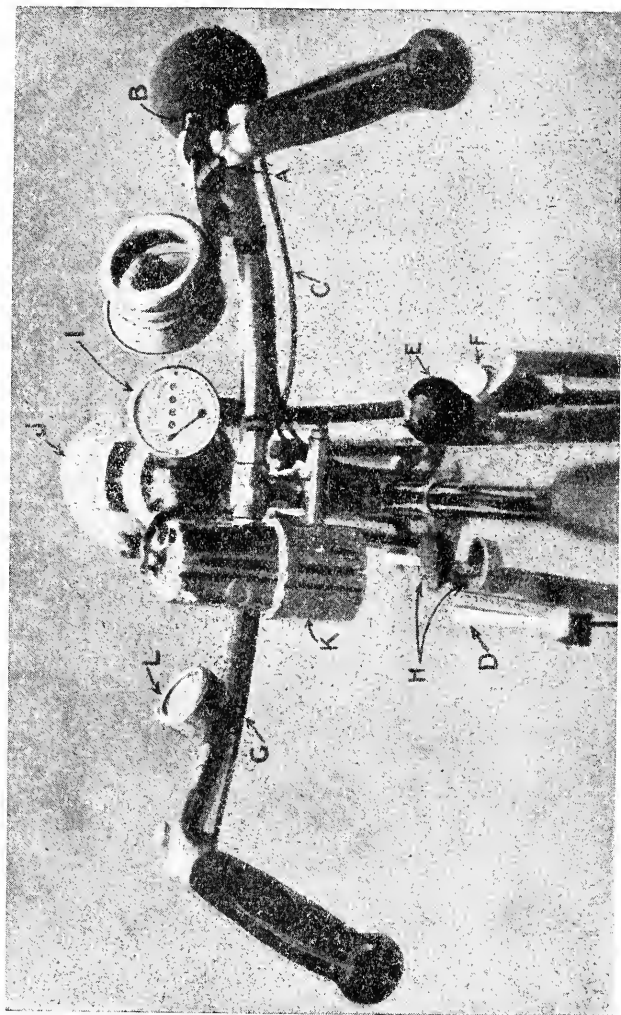
at low speeds, while, with the engine hot, there may be some possible risk of the escaping petrol igniting and creating a blaze. Directly, therefore, any petrol appears, release the plunger at once.

The rider now mounts the machine, sets the carburettor levers so that the " air " is either closed entirely, or nearly so, while the " gas " or throttle lever is from one-third to half open, and, with the exhaust lifter raised (to release the compression) give one or two sharp turns of the pedals (or a vigorous push down of the starting device, if one is fitted), at the same moment dropping the exhaust lifter, and the engine should fire straight away. The throttle lever must now be closed down as much as possible, short of stopping the engine, and the air lever set to suit, *i.e.*, opened as far as possible without causing the engine to misfire ; while the spark or ignition lever, which has previously been set at about one-third retard (or less) for starting, may well be left there during the running of the engine on the stand. This last-named lever is usually mounted on the side of the tank, but on some machines it is a handle-bar fitting.

Under no circumstances should the engine be run light like this for more than 30 seconds at a time, and, before starting it up, at least one pumpful of engine oil should be injected into the crank-case by means of the pump provided for the purpose, and which will be found conveniently placed either at the front or rear of the tank, and most probably in the former position. Never run the engine at any great speed on the stand, or, indeed, any more than is necessary at all. A reasonable amount of this sort of thing, just to get the hang of the working, or for test purposes after an overhaul, does little harm, provided the engine is well throttled down ; but the less the better, the principal reason being, of course, that the cylinder is deprived of the cooling effect which it gains when out on the road in passing rapidly through the air, while, being without load, the tendency is for it to race.

Points on Starting.

If handle starting is fitted, the exhaust lifter should be released just at the precise moment that the handle is brought, with a smart jerk, to the top centre. Do not put in a lot of energy on the down-stroke, but reserve your effort until the up stroke is about to be completed, then, with a good smart

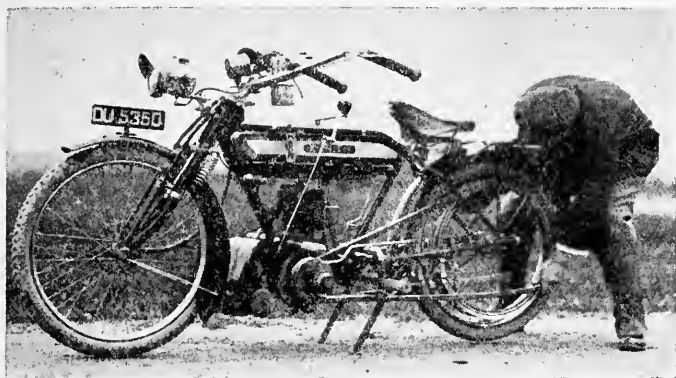


"SEEN FROM THE SADDLE."

The accessories and control mechanism on a motor bicycle.

- (A)—Carburettor throttle lever. (B)—Carburettor air lever. (C)—Cable of front brake. (D)—Spark or ignition lever. (E)—Handle for manipulating change-speed gear. (F)—Oil pump (for engine). (G)—Exhaust valve lifter cable. (H)—Oil and petrol tank-filler caps. (I)—Speedometer Dial. (J)—Headlight. (K)—Acetylene generator. (L)—Handlebar Watch.

upward jerk of the handle, drop the valve lifter, and she should fire at once. Unless the movement is a rapid one, no amount of handle turning will start the engine from cold, so be sure to let this matter have your best attention as



"PUTTING ON THE BELT."

With the right hand pull the wheel round backwards and with the left guide the belt on to the rim. Exhaust lifter may be held up by a clip. It is more convenient than raising it by hand, in the circumstances.

the critical moment occurs. Otherwise you may become weary long before the welcome roar of the engine makes itself heard.

When the engine is new, and particularly if the atmosphere is at all cold, it may be necessary to inject a little petrol through the compression cock on the top of the cylinder, to free the piston, before the engine can be pulled or pedalled round comfortably. The author believes in using a mixture of petrol and paraffin for this purpose—50 per cent. of each—the paraffin to free the piston, and the petrol to give the engine something to start on independently, to some degree, of the carburettor.

Do not forget that the necessary electric spark to ignite the mixture within the cylinder is produced by rotating the armature of the magneto, and the motion has to be conveyed in its initial stage by some means other than the engine itself, that is, by the rider pedalling or otherwise "getting a move" on the magneto driving mechanism. The spark is best at a fair speed, so do not be afraid to pedal round

smartly ; there is no need whatever to overdo it or work hard ; and, once started, the engine relieves you of the task of keeping the magneto going.

Legal Preliminaries to be Observed.

Having learned just what happens as the result of manipulating the levers, and with a growing feeling of confidence, as the ease with which the engine is stopped and started again is realised, it may be assumed that there is now no obstacle to hinder the long-wished-for first ride being indulged in. Let us first see, however, whether the requirements of the law have been satisfied before taking the machine out on to the road, where, unless everything is in order in this respect, we may find our progress hindered by some inquisitive police officer.

The driving licence must be obtained from a county council (not necessarily that which is responsible for the administration of the district in which the owner resides), before the machine can be lawfully driven on any public highway. Likewise, the registration numbers must have been allotted (again not necessarily by any particular council), but they must be exhibited both at front and rear of the bicycle, on a regulation type of plate and with the proper sized characters. It is further required that the owner of a motor cycle should possess himself of a licence "to keep a carriage," otherwise an Inland Revenue or local taxation licence, obtainable at any post office in exchange for the sum of one pound. It is not obligatory that this document should be taken out at once, but it must be obtained during the month of January in each year or, if the motor cycle is acquired later, then within three weeks from the date upon which the machine is used for the first time on the road. The driving licence and registration both cost the same—namely, five shillings. The local taxation and driving licences are renewable annually, and if the former is applied for on or after October 1st, it is only required that half the tax (*i.e.*, 10s.) should be paid for the remainder of that year, provided, of course, that the machine is not ridden prior to October 1st.

With everything as it should be in these respects, the rider, having filled up his petrol and oil tanks, is now ready to emerge from the motor shed for a trial run on the road.

CHAPTER II.

STYLES OF MOUNTING ; HOW TO MAKE AN EASY START ;
SETTING OF THE LEVERS ; WHAT TO DO ON GAINING
THE SADDLE ; DIFFERENT METHODS OF DRIVING ;
HOW TO STOP THE MACHINE ; THE RULES OF THE ROAD.

Different Styles of Mounting.

THOSE who are not accustomed to mounting a motor bicycle look with a certain degree of trepidation upon the act of so doing, and they will resort to almost any means to "get going" rather than that which involves leaping into the saddle after the engine has been started. This is known as the "running mount," and with a little practice can be easily and safely accomplished ; but it does not appeal, as a rule, to the beginner who is prone to err—and quite rightly, too—on the side of ultra carefulness.

Lightweight machines of small power can be pedalled along the road for a distance of a few yards, when, if everything is in order, the engine will fire directly the exhaust valve lifter is dropped ; but with heavier types this method is next to impossible unless on a down grade, and even then it is not easy, nor is it regarded as being the correct manner in which to start. It is better to get some friend or kindly disposed person to give you a push off than waste time and energy in trying to effect a start by pedalling, except, of course, where there is a down grade handy. In any case it is very inconvenient and tiring to start a heavy machine by pedalling.

When a free engine device is fitted, the starting difficulty—if such it may be called—is completely overcome, as the rider can, by using the clutch, sit astride his stationary mount with the engine running, and, when all is in readiness to go ahead, a gradual manipulation of the clutch handle (or pedal as the case may be) allows the engine to take up the drive and set the machine in motion without any need for the rider to leave his seat,

In the case of a medium or heavy-weight machine, unprovided with any starting device, the proper method is to first get the engine warmed up by running it on the stand for a few seconds, and then, with everything moving freely and the levers correctly set, to raise the exhaust lifter and



"NOW FOR IT."

One good hearty push, and if the engine is in good tune it will fire at once, and directly it does—

push the machine along a short distance at a smart pace, then drop the exhaust valve and, immediately the first explosion is heard, either hop on to the saddle straight from the road or mount by the pedal or footrest.

If the beginner feels at all nervous about mounting with

the engine firing, then his best plan is to raise the exhaust lifter for a second or so and drop it again the moment he is safely landed in the saddle. He must be smart about it, however, or the machine will stop owing to the speed of the engine having fallen below what is necessary to enable it to take up the load.



Hop straight on to the saddle from the road. If you prefer to do so, you can mount by the pedal or footrest.

Ready for the Road.

When ready to make the actual start, the spark (or ignition) lever should be placed somewhere near full advance position, the carburettor air lever closed, and the throttle lever about half-way open. The plunger of the carburettor

float chamber is next depressed until petrol appears* (as was explained in the previous chapter), and then all is in readiness for getting under weigh in the manner described above. If, on dropping the exhaust lifter, the engine, instead of firing, makes a sharp, clicking sound and the back wheel skids and pulls the machine up, it means that the spark lever is a trifle too far advanced and must be retarded



"A STANDING START."

A slight turn of the gear handle and away she glides. The engine has been running free while the rider leisurely took his seat.

a little, just as sometimes happens when starting up on the stand—the engine backfires instead of taking up the drive.

* With certain carburettors instructions to the effect that flooding must not be indulged in are sent out, but with the more generally used carburettors it is necessary, in a slight degree.

Different engines require different handling during the starting operation, and the best position for the various levers can only be ascertained by a little experimenting, when the rider will easily be able to discover the setting which suits his individual engine best. As a rule, the positions indicated above and shown in the drawing on page 27 may be taken as average ones, which will serve to ensure an easy start with the majority of motor cycles.

It depends to some extent upon the type of carburettor, the timing of the engine and magneto, and such like considerations, and it is well worth while to give this matter close attention from the first rather than subject oneself to a lot of unnecessary physical exertion in a vain endeavour to start under wrong conditions. Where a single-lever automatic carburettor is employed or any special device is present, the best way is to get the makers' catalogue and read up what they have to say on the subject.

Why the Engine Sometimes Refuses to Start.

In the event of the engine stubbornly refusing to fire, despite the fact that all the lever settings have been carefully adjusted, it may be for any one (or more) of the following reasons, most of which are very soon detected, and the fault remedied :—

- (1) No petrol in the tank.
- (2) Petrol in tank, but not flowing through to carburettor.
- (3) Jet of carburettor blocked.
- (4) Sticking carburettor slides.
- (5) Defective sparking plug—points wrongly adjusted (should be thickness of a visiting card apart), points covered with oil or filled in with burnt matter, which must be cleaned off. In a plug with three or four points, if only one is filled in it is sufficient to prevent sparking taking place (see Fig. 18, page 73).
- (6) High-tension cable from magneto to plug disconnected.
- (7) Dirty or mal-adjusted contact-breaker points (break of points should be same as spaces between plug points).
- (8) A short-circuit.
- (9) Handle-bar switch (if one fitted) left engaged.

(10) Valve sticking. (Rarely happens unless automatic inlet valve fitted.)

(11) Timing of engine or magneto at fault.

Of course, if the engine cannot be pedalled round easily, the defect must be looked for in other directions, as, for instance, a stuck-up piston which requires an injection of paraffin to disperse the thick coating of oil which is glueing it to the cylinder wall, the brake of the back wheel may be binding; perhaps the wheel itself is not wholly clear of the ground, or the exhaust lifter mechanism may require adjustment.

These contingencies make their presence so quickly felt that there can be no confusing them with any of the points enumerated above. The first and foremost thing is to get the engine moving freely before the driving power is applied—that is, by the rider's pedalling or otherwise actuating the mechanism; and when that has been done, if it does not start, in spite of repeated efforts to make it do so, the existence of some defect associated with the working principle as apart from the physical act of getting the parts in motion prior to running under power is indicated.

The First Ride.

We may now pass on to the next stage in the rider's progress—namely, that of mastering the control of the machine on the road—and for this purpose we may put ourselves in the position of one who, on the occasion of his first ride, has made a successful start, and is now in the saddle, confronted with the necessity of setting the pace at which he desires to travel and adjusting matters so that the engine will work smoothly and to the best advantage.

Before going on to that, however, another suggestion occurs to the author, and it is one which may possibly appeal to the reader who experiences lack of confidence in the handling of his machine for the first time. A quiet road, with a down grade, may be selected, and here the rider can practice steering the machine, while he pedals, or allows it to free-wheel down the slope minus the belt, and, therefore, without any possibility of the engine being used. This will familiarise the beginner with the handling of the machine apart from the control of the engine, and if he desires to repeat the experiment before bringing the latter into use he can usually find someone who will assist him to push the machine

to the top again, which task is not a formidable one with the belt removed; indeed, if the rise is a moderate one, it can—although such a course is not advisable—be accomplished without assistance. A better plan is, of course, to fit the belt on the pulleys and come up under power, but there have been many cases where novices have refused to do this until they have “got the hang” of the steering, which, of course, differs considerably, owing to the extra weight and altered saddle position from that of a pedal bicycle.

The rider, having effected a successful start, must now set the levers in such a manner as to cause the machine to travel at the speed he desires, and under conditions which are favourable to the proper working of the engine. We will assume that the road is a straight and level one, and that in view of the rider's inexperience speed is to be kept down to a moderate limit. The great thing, of course, is to make as much use as possible of the air lever, and to cut down the throttle opening as much as is consistent with regular working and the prevention of misfiring. Therefore, begin by setting back the throttle lever from the position it was placed in for starting, and simultaneously the air lever must be closed down also, in order that the mixture fed to the engine from the carburettor may not become too weak for the purpose of actuating it. The idea must be to work as economically as possible while attaining the speed required, and, with a view to keeping the engine cool, limit the throttle opening as much as possible, and give as much air as she will take without misfiring. These results may be attained on the level and at moderate speeds by giving about a quarter throttle; (or less) and air slightly more than this, the spark lever being placed a little way off full advance, the setting depending largely upon the type of carburettor and other circumstances.

Different Methods of Controlling the Engine.

At the outset the beginner should keep his one hand on the exhaust lifter and the other on the brake handle, and if not feeling quite confident, or should any necessity to stop arise, lift both at once. The effect of this combined action will be to shut off the engine and retard the impetus of the machine at the same time, and an almost immediate (as apart

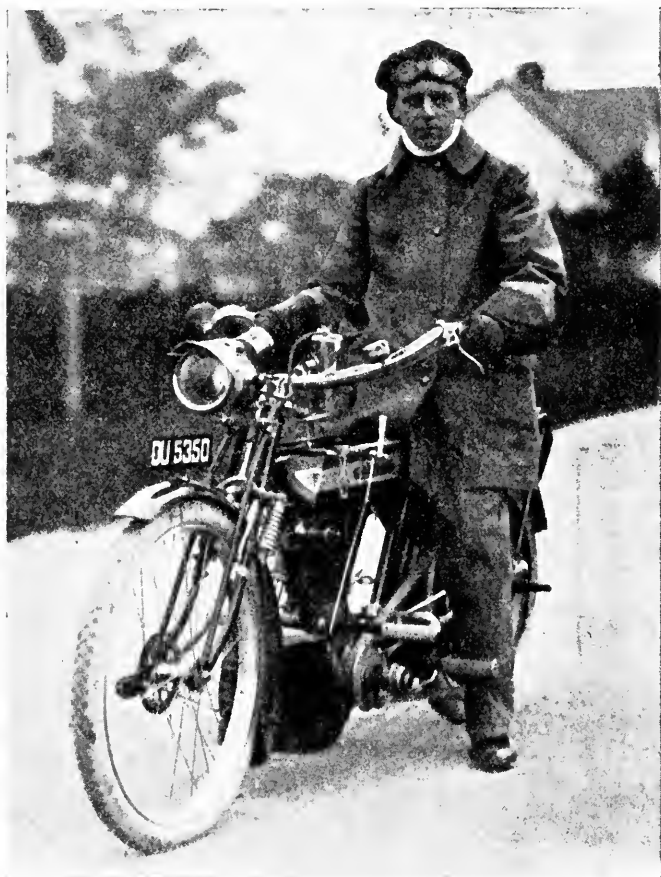
from a sudden) stop will be the result. It is not suggested that this is the orthodox or proper way of controlling the engine and the speed of the machine, but we are for the moment considering the position of one out on his very first ride and must make allowances for his absolute non-acquaintance with the ways of motor cycles, and pardon any possible nervousness, which, after all, is very excusable in the circumstances. It is not proposed at this juncture to say anything further concerning the management of the engine to obtain different results, or how to vary the method of driving to meet changing road and other conditions, as that is reserved to the next chapter. It may be remarked, however, that the plan of "driving on the throttle"—that is, to control the speed of one's machine by manipulating the gas lever, and thus directly applying and shutting down the power in varying degrees, as may be required—is a style which should be cultivated from the start, as little use as possible being made of the exhaust lifter for the purpose of limiting the rate of progress.

Many motor cyclists regard the exhaust valve lifter method as the best, or, at any rate, the easiest way of driving, but a moment's reflection should suffice to show them that it is more economical and better in every way to use the throttle valve, which, after all, is the device intended to control the admission of gas to the cylinder. When the throttle is closed, the suction exerted on the jet of the carburettor by the working of the piston ceases and petrol is no longer drawn through. It rises to the level of the nozzle, but no further. The exhaust valve suffers in the long run when the lifter is freely used while the throttle is left open, and although, as we shall see later, occasions on which the exhaust valve may be lifted with advantage are numerous; no experienced driver will disagree with the contention that speed control, under normal conditions, is not one of them.

How to Stop the Machine.

In anything like an emergency the very best way to stop the machine is to quickly close the throttle and apply the brakes, for, by so doing, the engine compression assists in the pulling-up process, whereas, if the exhaust valve is lifted, the compression escapes, and if the brakes are not quite O.K. the machine will drift on for quite an appreciable distance.

A gradual stop is effected by raising the valve lifter and using one brake only, at first, although when the point at



"READY TO DISMOUNT."

The modern motor bicycle is low built, and when bringing the machine to a standstill, the rider can place both feet squarely on the ground while seated in the saddle.

Hence his feeling of security.

which it is desired to bring the machine to an actual standstill is reached it may or may not be advisable or necessary

to touch the other brake as well. The more gradual the stop the better for the tyres, of course; and no doubt there are other parts, including the engine, which prefer to slow down easily. The prospective motor cyclist often appears to be more concerned about the means provided for stopping the machine than anything else. He need not be alarmed on that score, as there are several independent ways of stopping the engine, and as regards the rest the law provides that two independently controlled brakes, each capable of itself holding the machine, must be fitted.

The "Rule of the Road" for Motor Cyclists.

It is hardly necessary, perhaps, to point out that in this country as distinct from most others, the rule of the road is that, on meeting other vehicles, one passes them on the left-hand side, while, when overtaking, the right-hand is the proper side. A "led" horse is an exception, the idea being that the person in charge of it should come between the animal and yourself. Therefore, pass him on the right if meeting, and on the left if overtaking, it being assumed in making this statement that the usual plan of leading the horse from the "near" or left-hand side will be followed.

If anyone in charge of horses holds up his hand as you approach you must stop, not only your machine, but your engine also, for, should you fail to do this and the result is an accident, you will in all probability be held entirely to blame, and may have to suffer serious consequences. Remember, also, that the pedestrian has, by law, a prior right on the roadway, and is free to walk thereon if he chooses, although a pathway (on which, of course, *you* may not trespass) is provided.

Great care is required in observing the speed limits through towns and villages, and especially where the existence of schools and sharp turnings are indicated by the warning signs at the road side. The diagrams on the opposite page will tend to make clear the meaning of the various "signs and wonders" as they are sometimes called, which are to be found nowadays in every district, and, although perhaps some of them may be safely ignored, where one is well acquainted with the road, it is best to keep a good look-out for them everywhere else.

There is no greater delusion than that apparently entertained by some motorists, *i.e.*, that they have a prior right of way along the roads, and that everyone else must make room for them on their approach. They are, of course,



Red Triangle



White Ring



Red Disc



White Diamond

*Speed warning
for cross roads, etc*

*Speed limited
as marked*

*Motors
prohibited
on road*

*Motor
notices*

Fig. 2.—Road Signs and what they mean.

entitled to their proper share of the road, and much unpleasantness and friction would be saved if only the principle of give and take were observed by all drivers of vehicles on the common roads.

CHAPTER III.

DRIVING ON THE LEVEL, ON HILLS, AND IN TRAFFIC ; WHAT TO DO IF STOPPED ON A HILL ; COMPRESSION AND HILL-CLIMBING ; HOW TO TAKE CORNERS ; COOLING THE ENGINE.

Driving on Level Roads.

WHEN driving a motor cycle along a level road, the conditions are such that one can run at almost any speed he likes, whether fast or slow, with the minimum of trouble and expenditure of power. In fact, if it were possible, as of course it is on the military roads of France (or the Routes Nationales, as they are called), to find here a road stretching away for miles in a straight line, no better place for the beginner to practice on could be desired. Later he will require, for his practice ground, a hilly road, with corners, and an occasional bit of traffic, so that he may learn how to negotiate each in turn with confidence and ease ; but, for the moment, we will imagine ourselves driving along the flat, with a mile of open road before us, clear of every obstacle and impediment.

The object to be aimed at is to get the engine to run, not only quietly and smoothly, but also as cheaply as possible at the pace required, which, for present purposes, may be deemed to approach the legal limit of 20 miles per hour. A small throttle opening will suffice to ensure this on the level, and, as before stated, the exact position of the gas lever can only be determined precisely by the individual rider on his particular machine. As a general rule, in the circumstances named, it will be a very small opening—less than one-third—and, indeed, only just open perhaps if the carburettor is well tuned and the load carried a normal one. As regards the air lever, this must be placed to give a wider opening than the gas ; in fact, it may be remarked in passing, that the rider should always take it to mean that things are not quite as they should be if, unless when running dead slow or under the most strenuous conditions—as, for instance, on a very

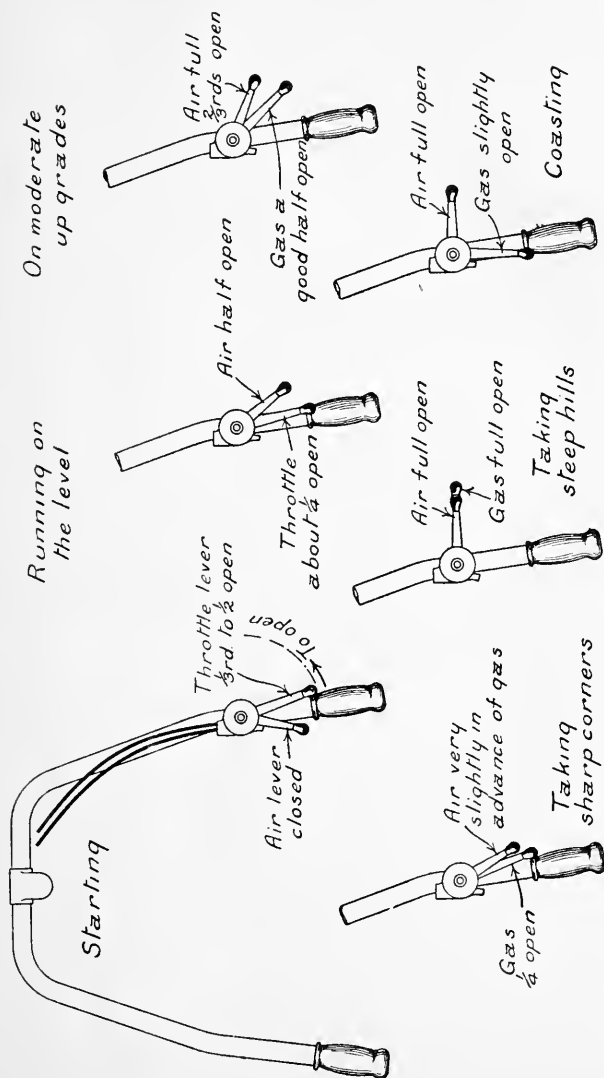


Fig. 3.—Positions of Carburettor Levers for Various Running Conditions.

steep up-grade—the air lever has to be shut down more than the throttle lever.

As the author has remarked elsewhere, air is cheap and petrol is costly ; so that, on that ground alone, it is better to use as much of the former as circumstances will allow, in order to save the latter ; but, further than this, the engine works better on a suitable mixture, *i.e.*, one in which the correct proportion of air enters. On a straight, level road, it is quite unnecessary to alter the placing of the levers, unless one desires to vary their speed, or it becomes necessary to stop altogether ; and one can ride for long distances with only the minimum of attention to the engine, consisting, in the main, of injecting a pumpful of oil every so many miles—usually, when riding solo and under normal conditions, from every eight to ten miles, according to the size of the oil pump, weather conditions, and other influences, which affect the amount of work thrown upon the engine.

Setting the Levers for Good Results.

It is the best plan to run with the spark lever well advanced ; indeed, the full range may be given in this direction when the conditions are such as we are for the moment considering—that is, maximum advance position. This tends to help the engine to run cool, as it causes the spark to take place as early as possible in the firing stroke, the combustion of the gases being thus more completely effected, and their escape from the cylinder facilitated. Of course, there is no harm whatever in running with a slightly retarded spark, so long as it is not overdone ; but it is better to well advance the lever and control the speed by other means indicated than that of causing late explosions in the cylinder by “linking up” the timing lever.

The golden rule, therefore, is to give the minimum gas opening, maximum air opening, and as much spark advance as she will take, and it is on the level straight road that these settings may be indulged in to the utmost, and every advantage taken of running along quietly and smoothly, and under the most favourable conditions. Slight checking of the speed may best be effected either by closing down the gas lever a trifle or closing it altogether for a moment. Another way is to raise the exhaust lifter until the rate of progress has been brought down to what is required ; but the throttle

method is, as before remarked, the better way of controlling the machine. It helps to keep it cool and to economise petrol, and it also tends to keep the speed uniform. If a magneto cut-out switch is fitted, speed may be regulated by using it for the purpose of slowing down; but if this be done, care should be taken not to let too much way be off the machine before the switch is released, and it may be advisable to close the air lever a bit before "letting in" the engine again.

The application of the switch effects the discontinuance of the electric sparking; that is to say, when the switch is applied by pressing down the blade plunger, or is otherwise brought into contact with the handle-bar (or other metal object), the current is interrupted, and instead of going along the high-tension cable to the sparking plug, it is diverted from this path, and caused to pass away to "earth" (say the frame of the bicycle) instead of causing a spark to take place within the cylinder.

Hill Climbing on a Motor Cycle.

When we come to driving the machine uphill, it is, of course, at once necessary that more power should be applied, and although this in itself is easy enough, there is undoubtedly a good deal which may be usefully said on this aspect of our subject, for it is here that really good driving manifests itself, and that one of the greatest charms of motor cycling is realised.

If the machine is single-gearred, the rider has to rely solely upon the throttle and other levers to obtain the power required, and his object must be to maintain the necessary engine speed to enable him to climb the hill; whereas, if a two-speed or other variable-gear device is fitted, he has at command an independent means of keeping up the power, which to some extent is independent of the actual throttle manipulation. For the moment, however, we need not enter into the subject as it applies to the negotiation of very steep and difficult hills, but confine ourselves to the class of road ordinarily met with, and in which the profile is of a give-and-take order.

On approaching the hill the rider should increase the speed by opening both the air and throttle levers, and also, if he has not quite recently done so, give the engine a pumpful

of oil. As the grade is entered upon, he should keep his thumb on the gas lever, and as the speed falls, slightly and gradually increase the opening of the same, commensurately doing likewise with the air, although in many cases it is advantageous to give a good wide air opening and control entirely on the throttle. Any diminution of speed must be followed by a further opening; but in ordinary circumstances the movements should be gradual and slight, rather than sudden and wide, and it is only when a decided rise is encountered that there should be any rapid and wider opening of the throttle. The principle to be followed is that of responding to the call of the engine as it occurs, training one's ear to the beat, and striving, as before remarked, to maintain the speed as the hill stiffens, for in the successful attainment of this object lies the secret of being a good driver on hills. Sudden, jerky movements of the levers are likely to "upset the mixture," and cause the engine to misfire at a critical moment.

The diagram on opposite page will enable the reader to follow by graphical means the series of lever movements required to meet the conditions encountered during a straightaway climb, in which the grade varies from an easy slope to a steep acclivity. Should there be a sharp turning anywhere on the hill, or the presence of other vehicles hinders the rider in his ascent, some departure from this mode of driving may become necessary, for any check, beyond quite a slight one, means a certain loss of speed, and consequently of power, which must be regained if the hill is to be successfully surmounted.

To be impeded on a hill, even though it be a stiff one, is not a matter which need trouble the rider of a variably geared machine much; but, where one has to rely for hill-climbing on the same gear as he uses on the level, it makes all the difference in the world whether the road is clear or not. When severe conditions occur, the rider should get all the speed possible on the machine as he approaches the hill, the engine having received a pumpful of oil just prior to the effort being made. The air lever may be opened wide, and the throttle a good half open. The spark lever is set, to begin with, at full advance. Now, as the grade stiffens, the throttle is opened still more, and directly the engine shows signs of slowing (with a further rise still to be overcome)

full throttle may be given. Any reduction of engine speed after this is best met by *slightly* closing the air lever, and if even the slightest knock is heard in the engine the air must be closed still further, while it may be advisable next to retard the ignition a little, each of these movements being made by degrees, but in good time, and each terminating at once when the knocking sound ceases and the engine gives a spurt forwards.

Failure to Climb Hills.

The successful negotiation of a really steep hill is one of the greatest charms which motor cycling affords; but it may become one of the most trying and fatiguing of all his experiences if the driver bungles the manipulation of the levers or fails to do the right thing just when it becomes necessary. Experience alone can give him that confidence in himself and his machine which is required to make the successful hill-climber, and let it be clearly understood that there is all the difference in the world between merely climbing a hill and doing so without letting the engine suffer.

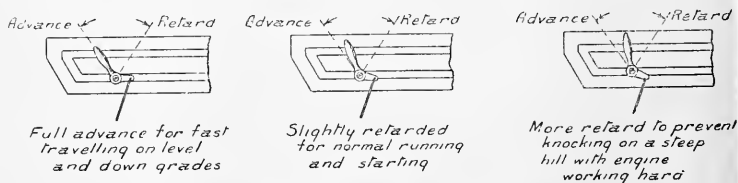


Fig. 5.—Settings of the Ignition Lever for Hill Climbing.

Every beginner meets with a certain number of failures on hills at the outset of his motor cycling career; but let him not be discouraged, for the ability to do it is there right enough, but the experience in handling the mechanism is for the time being wanting. The machine will climb better when the engine is cool, so, if you have any doubts about being able to manage the big hill looming ahead, by all means have a rest before tackling it, giving the engine time to cool down, and taking this opportunity of injecting the pumpful of oil to which reference has already been made and which always helps when there is any climbing to be done.

Do not stop your machine at the very foot of the hill, but some little distance back along the road, so as to give

yourself space in which to get up speed before the grade is entered upon.

Should you be so unfortunate as to fail on the hill, either owing to wrong handling or any other cause, it may be very difficult, if not impossible, to re-start from the point at which you are stopped, or, although perhaps just possible with a big effort, it is unwise to subject yourself to such a strain as is entailed by pushing a motor bicycle on a steep up-grade. Much better return to the foot of the hill, give the engine time to cool, and inject another pumpful of oil ; then, with your recent experience fresh in your mind, have another go at it, when it is more than probable that you will manage the task.

Of course, you must not attempt the almost impossible, and then rail at the machine because it will not do it. It may be that the belt is slack and wants shortening, so that the slipping which at present occurs directly the worst of the load comes on to the engine may be prevented. This is a matter which will have to be put right before the climb can possibly be accomplished.

Causes of Failure.

Cases have occurred in which a rider has failed on a hill because the petrol tap on his machine has, in some way or other, got either partially or entirely turned off, with the result, of course, that just when the engine requires a good feed of mixture it gets hardly any at all. A jet which is too small or has become partially choked will interfere with the hill-climbing powers of the machine, and sometimes the engine will perform better if the rider's finger is kept on the float chamber plunger during the ascent, so as to maintain the level of petrol in the chamber. If this be so, however, it points to the need for adjustments in the carburettor.

Gearing and compression play an all-important part in connection with hill-climbing. The former must be of a suitable ratio for the task, and, later in this chapter, attention is called to the possibility of using the adjustable pulley as a means of facilitating hill-climbing. An over-gearred engine works at a tremendous disadvantage in any circumstances, but never more so than when it is tackling a steep up-grade. If there is any leakage of compression, the engine power will fall below what it should be ; therefore, see that

the valve caps are properly screwed home as well as the sparking plug and compression cock, and that the copper-asbestos washers between each and the cylinder are in good condition. The exhaust valve must be periodically ground into its seating, and the piston rings not allowed to lose their springy, properly-fitting character.

Some Aids to Hill Climbing.

Sometimes, just at the critical moment, the rider can render material assistance to his engine by a little lusty pedalling ; but, to be effective, this must be commenced before, and not after, matters have assumed an almost hopeless stage, and then only if the remaining distance to be covered is relatively a short one. With a lightweight machine a good deal of pedalling is sometimes done, and it is nowhere near so fatiguing as one might think, for you are merely sharing the work, and not taking upon yourself the task of propelling the machine entirely.

An experienced rider often leaves the saddle for a moment or so at the critical juncture, and runs alongside for a few yards, and the engine, once relieved of his weight, will pick up surprisingly. The effort required is not a big one ; but there is a knack in dismounting while going fairly fast, and the beginner will very likely come to grief if he attempts it too early in his career. Of course, where a side car is fitted, the thing is easy enough, as there is then no balancing to be done.

Changing Gear on Hills.

These remarks are meant to apply to cases in which the machine is single-gearred, and not where the rider has at his disposal a variably-gearred device, for then, directly the proper moment arrives, all he does is to "change down" and remain comfortably in the saddle, as he would in other circumstances. Even with a change-speed gear, however, motor bicycles fail on hills sometimes, and the inexperienced often grumble when this occurs. As a rule, it is their own fault and not that of the engine, and later they will discover why it occurred, and will apportion the blame to the proper quarter. When putting in the low gear, throttle down the engine somewhat ; otherwise it is likely that it will race. As the grade increases, a further opening can be made if and when required.

A free engine clutch alone is not of great assistance in hill-climbing, although, in the hands of a really capable driver, surprising results may be secured by slipping of the clutch. It is not good practice, however, to rely on this method, and it does the engine harm if persisted in too freely. Sometimes, just as a hill is being crested and the engine is labouring, a light application of the clutch will work wonders, and the enthusiastic rider has been heard to exclaim, "This is as good as a two-speed gear."

Let him not, however, be misled in this direction. It is *not* as good, nor anywhere near it; and, moreover, the clutch is not intended to fulfil this purpose at all, but to assist the rider when riding in traffic, round corners, at starting, and generally when a low speed is either required or rendered obligatory for the machine, but it is not desired to stop the engine.

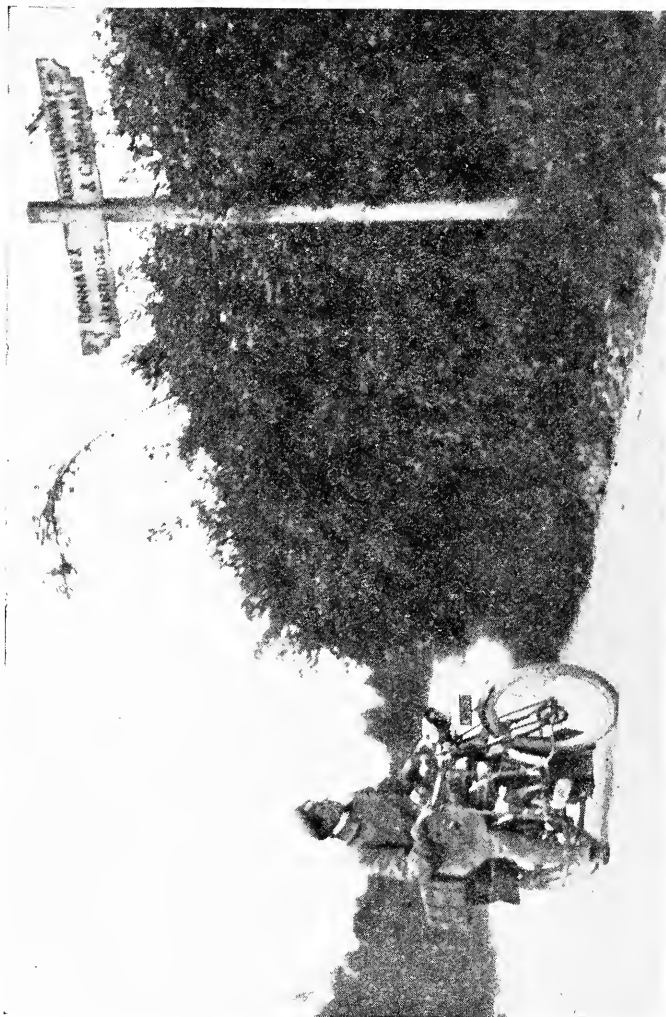
Intelligently used, a free engine clutch is a great boon to the motor cyclist. It does away with the need for a running mount, saves him the fatigue of jumping on and off his machine when impeded, and assists him generally in the control. It must never, in any circumstances, be likened to a variable gear nor used to take the place of one.

Cooling the Engine after a Climb.

When the climb has been successfully accomplished, lose no time whatever in re-setting the levers for normal running, and if a long "run down" follows, take full opportunity of cooling the engine, if only as a reward for the good performance it has just put up.

For this purpose the throttle may be left slightly open and the air opened wide; the switch (if one is fitted) should be used for "cutting out" the magneto, and the exhaust valve lifted. Let the machine coast as far as it will under these conditions, during which a cold mixture of petrol and air will be pumped through the cylinder while sparking at the plug is suspended. These things, combined with the passage of the engine through the air whilst no explosions are taking place, have a wonderful effect in cooling it down, and the cylinder is enabled to dissipate much of the extra heat generated within it during the climb, and which would otherwise be retained for some time longer in the affected parts.

If the climbing effort has tried the engine much, and the



"WHICH WAY?"—A TOURING INCIDENT.

If the machine is fitted with a free engine device it is unnecessary to leave the saddle when consulting a signboard. No need either for the "running" mount, which in this case would call for gymnastics to clear the bag on the carrier.

hill, instead of being followed by a declivity, is succeeded by level or undulating ground, it is as well to run easy for a bit. By this is meant that the rider should refrain from going ahead as fast as he otherwise would for a little while.

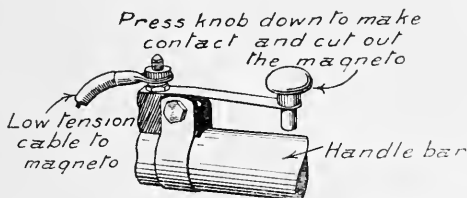


Fig. 6.—What the Magneto Cut-out Switch looks like. (It varies in form.)

He need not crawl along at a very slow rate, but merely give his engine time to get its breath before letting it have its head again.

The author is sometimes asked to say which, in his opinion, is the better of the two alternative methods possible in a machine fitted with a clutch for cooling down the engine. Instead of following the plan already described, the engine may be stopped altogether by throwing out the clutch, and allowing the machine to coast down the hill with the minimum of friction and noise. Nothing could be more delightful than this sensation of travelling at high speed and in almost absolute silence on a well-sprung, easy-running machine; but it is doubtful whether the engine really benefits as much in such circumstances as when it is driven round by the back wheel while the pumping action previously referred to is going on. Whichever method is resorted to, however, care must be taken to bring the engine into play again while the machine is still running at a fair speed, otherwise the effort of taking up the load with too much way off will cause it to knock—a process harmful to the bearings and other parts. In these circumstances, they receive a hammer-like blow, caused by the explosion taking place too early—that is, before the piston and crank-pin are favourably positioned to receive the driving impulse. When switching on again, it is a good plan to raise the exhaust lifter for a moment, while the air should be closed a little, and a trifle more throttle given just prior to bringing in the engine. This will cause

suitable mixture to be fed to the engine, and will enable it to take up its work again smoothly and without jerk.

Everything depends upon the character of the road immediately ahead, and matters must be adjusted in accordance with this alone.

The " Art " of Gear Manipulation.

Those who possess motor bicycles fitted with two-speed gears should cultivate the knack of knowing just when to " get down on to second," or, in other words, when to engage the low gear to the best advantage—that is, not too early nor too late, but just at that moment when the engine has gone as far as it can on top gear without losing much of its speed. There is quite an art in this, and although it is by no means absolutely necessary that one should be " just so " in the manipulation of his gears, there can be no doubt at all that it makes all the difference to the engine and its chances of getting to the top whether the gear is changed at the right moment or otherwise. Therefore, the thing is well worth studying, and is one of those matters in which a little practice soon makes—well, if not perfect, then approximately so.

A three-speed gear is superior to one with only a single change of gear, as it permits of the ratio being altered to a lesser degree, so that hills which are just too steep to be managed on top gear can be easily negotiated without going down to one which is unnecessarily low. The infinitely variable, or expanding pulley type is better still, for here the changes can be rung indefinitely, within the limits prescribed by the diameter of the pulley, and the drop or rise in the gear may either be a big or a very small one, as circumstances—and the driver—may decide. With this type of gear at his disposal, the rider can vary the speed of his engine by stages to meet almost any contingency and, with ordinary care he can so manipulate things that the engine is always working to the best advantage.

Uses of the Adjustable Engine Pulley.

Owners of single-gear motor bicycles are nowadays much better off than was formerly the case, as they are provided with an adjustable pulley in the majority of cases, by means of which the gear can be set to meet the class of work to be

performed, but only, of course, by adjusting the pulley flanges while the machine is stationary, and *not* while it is being ridden along the road. However, the device is a very useful one, and for temporary purposes—as when faced by a hill which the machine will not climb on its normal gear, or when riding in traffic—the gear can be lowered for the time being, and raised again when normal conditions have been resumed.

Further than this, an adjustable pulley permits you to strike a good average gear ratio in accordance with the work generally to be done, and this, when taking a side car one day and riding solo the next, is a real advantage. Then again, it enables you to run a new belt in without cutting so much out of its length, as you can start at the bottom of the pulley and work upwards to the topmost gear as the belt stretches.

To provide against the differences in belt length rendered necessary by adjustment of the pulley, it is a good plan to cut, say, two short pieces of belt, each a few inches in length, the one longer than the other. Each piece must be provided

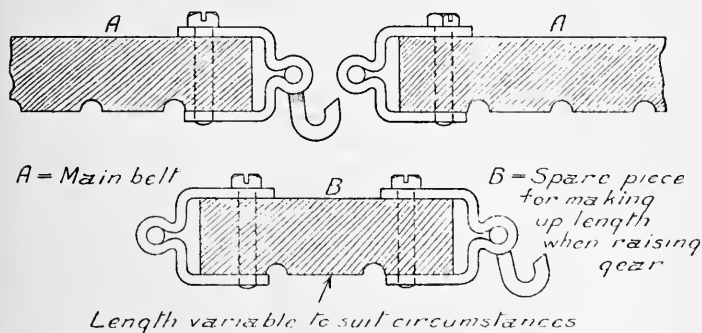


Fig. 7.—This is the means adopted for varying the length of the belt when raising or lowering the gear by means of the adjustable pulley.

with a fastener, as shown in Fig. 7, and the insertion of one piece or the other in the main belt, or its removal therefrom, will enable you to make up the difference required, as the pulley flanges are moved towards or away from one another to raise or lower the gear.

Motor Cycling in Traffic.

When it comes to traffic riding, more than usual care is required. A practised rider will pick his way along a crowded street on a motor bicycle almost as easily as will a pedal cyclist; but, to the beginner, "traffic" presents many difficulties and often much trepidation. Nothing of the kind should be attempted until the rider is quite used to his machine, and even then great caution must be exercised and as few risks as possible taken. If the machine is single-gearred, the best way is to drop the belt down into the adjustable pulley until a fairly low gear is obtained—say $5\frac{1}{2}$ to 1; then run with the spark lever a little retarded, a restricted throttle opening, and not too much air. These things tend to heat the engine up somewhat, so it is advisable not to do any more riding than is necessary under these conditions. For ordinary stretches of road, with intervals of traffic riding, one need not depart much from their normal style of driving, but they should always be prepared to stop at any moment, and often the need to do so arises very unexpectedly.

When overtaking another vehicle, and especially if it is a bulky wagon, omnibus, or tramcar, make certain that there is a clear road ahead before attempting to pass. Some of the worst accidents have occurred through neglect of this primary rule; and when traversing a tram route, whereon the cars cannot make way for you whatever the situation may be, it is more than ever necessary to be cautious and to keep the machine at all times well in hand.

The lever setting which usually gives the best results in traffic is throttle about one-quarter open (or very likely less will be even better) and air about the same. Then, on running up behind a vehicle, and being compelled to slow down somewhat, reduce both a trifle, and on going ahead again (but still not having an altogether clear road in front of you) cut the air down, when she will pick up just sufficiently to keep going at a comfortable speed, and without jumping away too fast.

Although the plan cannot be recommended, it will be found, while negotiating crowded streets with the throttle closed well down, that if the exhaust lifter be raised the veriest trifle the speed will remain constant at what is desired, and in some engines this is a very pronounced feature. This prac-

tice is considered by some to be rank bad driving, and the exhaust valve, if it could speak, might very well object to it; but the effect is remarkable, and as the engine is running at a low speed and well throttled down it cannot do much harm. The same dodge is sometimes resorted to when rounding corners, and generally when speed has to be kept down for a few moments at a time. The author will probably be taken to task for countenancing this; but inasmuch as it is being done every day, and that a lot of "knocking" in the engine is saved thereby, it is not such rank heresy as some would have us believe. If difficulty is experienced in getting the engine to fire regularly at low speeds, it shows the need for a carburettor adjustment as a rule, and the beginner had better consult someone with experience, and take note of what he does when making the adjustments.

Strangely enough, when the machine is travelling at a good pace, if the exhaust lifter be very slightly raised, it will usually be found that the speed *increases* to a small degree. Various reasons have been advanced for this, and it is doubtless associated with the escape of the exhaust gases. Under these circumstances, the valve never properly seats itself, and this presumably facilitates their escape. It is hardly a variable compression device, but tending in that direction.

Driving Round Corners.

In negotiating corners the motor cyclist should drive with care, especially if the road is a narrow one and the turning is acute. Speed should be reduced, and the rule of the road as to keeping to the near side observed as carefully as possible. Drive as though you knew some obstacle was awaiting you out of sight round the corner, and thus be prepared for that which may actually happen and would otherwise have taken you unawares. Having shut down the throttle somewhat, be prepared to open it again directly you see a clear road ahead, that is, before the machine has lost too much way, and it is advisable in most cases to reduce the air opening as the corner is taken.

This balances the mixture, and relieves the rider of the necessity of altering the position of the throttle as much as would otherwise be necessary; indeed, if the latter is set for slow running already, nothing more than a slight manipulation of the air lever will be needed to ensure the necessary slowing down and picking up again of speed.

Some riders are very clever at "corner work"; but others there are who either take foolhardy risks or else bungle the control and cause their engines to knock. The thing is easy enough with a little practice, and represents nothing more nor less than the need for a little cautious driving for a moment or so, just as may be required several times during every ride on a straight road, for one reason or another.

Stability is sometimes afforded to the rider in taking a sharp corner, and especially when it comes on one unexpectedly, if the foot nearest the side to which the road curves is removed from the pedal or rest, and is brought into contact with, or allowed to trail on, the road. This will be found to act, in a sense, as a pivot, and to steady the machine, which will then respond much more readily to the steering, while the balancing is greatly facilitated. The side of the road can be hugged closely, and a greater general sense of security enjoyed. The exhaust lifter is generally raised when doing this.

Measures of this kind are rarely necessary; but a sharp curve while climbing a hill, when it is desirable to keep up a good speed, will sometimes make it almost obligatory to put out the foot, if one is to get round in comfort and gain the top: When a side car is attached to the machine, the negotiation of corners becomes a matter requiring a good deal of attention and care, and, in the chapter which follows, some remarks on this particular point, based on the author's long experience with this type of vehicle, will be found, and it is hoped that the reader will carefully peruse them. It is desired, in making the above remarks, to lay emphasis on the need for care when taking really sharp corners, and especially when traversing narrow country lanes. On main roads and round easy corners there is no need to take all this trouble.

A free engine clutch helps tremendously in driving round corners, just as it does at all other times when the speed of the machine has to be reduced but the engine must be kept going. Most machines are adapted for a free engine clutch of one sort or another, which can be fitted without much trouble and, seeing what a great convenience it is, one may be pardoned for wondering why greater use is not made of it.

CHAPTER IV.

USE AND MISUSE OF THE "CUT-OUT"; DRIVING WITH A SIDE CAR; LUBRICATION, AND THE USE OF THE OIL PUMP

Moderation and the "Cut-out."

A LARGE number of motor bicycles at present sold are fitted with what is known as a "cut-out," which, in other words, is a device for enabling the exhaust gases to escape with greater freedom from the cylinder to the atmosphere. At the moment of writing there is some talk of the authorities decreeing that the use of a cut-out is to become illegal, on the ground that the noise occasioned by its use constitutes a public annoyance; but, up to the present, no fiat has actually been issued, and consequently there is nothing to hinder either the makers from fitting the appliance or the motor cyclist from using it.

When the cut-out is opened it will usually be found that the machine gives a spurt forward, and that its speed increases in a more or less degree, but if the difference is very marked it shows fairly conclusively that there is something amiss with the ordinary silencing arrangements, and that an undue measure of back pressure exists. The engine, in short, is being partially choked, and is working at a disadvantage.

It is next to impossible to devise a silencer which allows the engine to run very quietly and yet be free from back-pressure, although much has been done of late in this direction, and the general trend of practice is to provide reasonable quietness in normal circumstances with a cut-out in reserve when extra power and speed are required.

The motor cyclist should refrain from using his exhaust cut-out when passing through towns and villages, and also when restive horses are met with on the open road. Indeed, the rule to go upon in this matter is that of never using the cut-out if it is likely to cause annoyance to others, and thus to do nothing, in this direction, which is likely to bring the

motor-cycling movement into disrepute among other sections of the public.

While out on the open road, or when tackling a hill, some advantage is gained at times by using the cut-out to free the exhaust, and there is no reason whatever why one should not, then, make what use he likes of the means at his disposal. That class of rider, however, who takes a delight in riding through towns and other populated places with the cut-out open is a public nuisance, and in the interests of more reasonable people should be suppressed.

Side Car Driving.

We may now turn our attention to that most fascinating phase of motor cycling—driving with a side car attached.

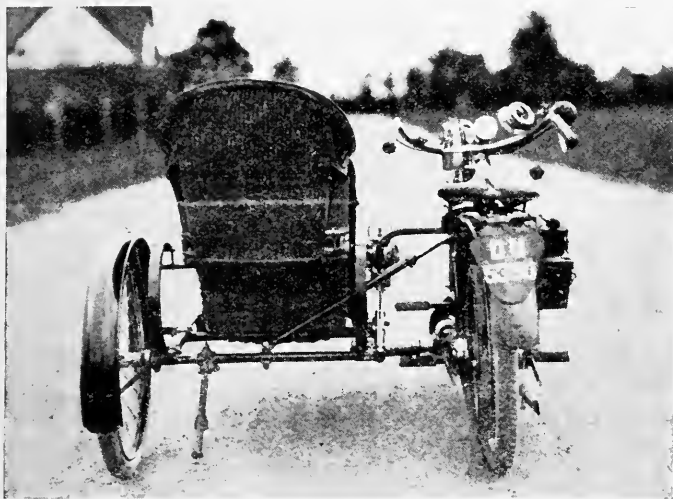
The side car cannot be defended on mechanical grounds, for it is obviously wrong in principle, if not in practice, to attach the load to be hauled at the side of the propelling agent. Nevertheless, the combination forms a light and very sociable contrivance, has the advantage of being readily attached and detached, and forms a delightful means of getting about the country for two persons.

The author has had some considerable experience with side cars attached to motor cycles, and so perhaps may be permitted to speak with knowledge on the subject. Nowadays the little vehicles are made so strongly and afford such comfort to their users that few (if any) of the inconveniences and none of the dangers formerly associated with them remain. Of course, we are speaking now of side cars made by reputable firms, whose long experience in this class of work has enabled them to eliminate the earlier defects and give us something which is not only safe and comfortable, but which, when correctly aligned, throws but very little strain upon the bicycle frame.

Selecting a Side Car.

If there is any one direction more than another in which the motor cyclist should not grudge the outlay of a few extra pounds, it is in the purchase of a side car. It is much better to pay a fair price and have a really good article than take the risks which the use of an inferior one entails. Accidents have occurred through the axle of side cars breaking, and some of them have been serious ones. The connections which

hold the two units together have, on other occasions, given way, or come unfastened, with the most unfortunate results. It has in practically every instance been discovered that the side car was of the "cheap and nasty" kind, purchased for a ridiculously small sum when new, and the penny-wise-



"SEEN FROM THE REAR."

It is very important that the relative alignment of bicycle and side car should be correctly adjusted: Both should stand upright and not lean to either side. They can be connected up or separated in under two minutes in the above pattern.

pound-foolish owner has been content to risk the life and limb of friends and relations (as well as his own) on contraptions of this kind, when for just a pound or so more he could have avoided practically all risk.

In selecting a side car one must bear in mind the power of his engine. If this is moderate then he should choose a car which, although soundly constructed, is of lighter build than some others. Much depends upon the type of body fitted, and it is here, rather than in the "chassis" or framework, that the difference should come in.

Alignment and its Effect on Steering.

Then, it is all important that the alignment of the side car and bicycle when connected up should be as nearly perfect as possible. Some skill is required to effect this, and the purchaser will be well advised if he entrusts the work to those accustomed to it, and afterwards goes over the connections himself to see that all is in order before he invites his first passenger to take a trip with him.

With a side car attached the steering of the bicycle, of course, becomes affected and the feeling is much the same as when riding a tricycle. It takes a little getting used to and the beginner is advised to practice with the side car "weighted" before taking a passenger. The best way is to find a nice, long easy down grade, and to free-wheel down it, without the engine firing, for a start, and it will require but very little practice to become proficient.

If the side car is empty the steering, except at corners, is affected to a small degree only, so that with a view to mastering the thing as quickly as possible a "dead" load, as, for instance, petrol cans filled with water, or indeed almost any suitable weighty object, may be used as ballast.

Corners and the Side Car.

When taking a sharp corner with the side car empty, unless caution is exercised and the speed reduced as much as possible, it will be found that there is a tendency for the side-car wheel to lift from the ground, and in extreme cases the whole combination may turn over. Nothing but ordinary care is needed to obviate this risk, and, with the passenger seated, it becomes impossible, unless deliberately sought, as for instance, by taking the corner at full speed or somewhere near it. Even then it is highly improbable that the machine would actually turn over. It is much more likely to be forced off its course and run into the opposite hedge or whatever happened to be there.

There is little or no risk whatever in taking *right-hand* corners, for then the side car wheel trails, more or less, after the bicycle; whereas in the case of a left-hand sharp turn the tendency is to urge the wheel round unnaturally and in opposition to the forces which are exerted in propelling the vehicle and the direction it seeks to take. If we regard

for a moment the whole combination as a rigidly built vehicle, and draw a centre line longitudinally through it, we find that the bulk of the weight is on one side of the line and a much less proportion on the other. The bal-



"NEARLY OVER."

When taking sharp left-hand corners with an empty side car reduce the speed as much as possible, or you may turn over.

ance is, as a matter of course, affected by this, and as, in taking the corner, the bicycle cannot lean over as it otherwise would, but is held rigidly upright, it exerts a pressure in opposition to the direction which the side-car wheel would like to take; that is, a straight one.

The wheel must find some outlet for the stored energy, and what amounts in some part to arrested motion is set up. As it cannot follow any other direction it takes the line of least resistance and rises, with the possible results already mentioned.

It is very necessary therefore, to keep the speed down when taking sharp corners to the left side, although when the curve is an easy one the speed need not be much reduced. These remarks are based on the assumption that the side car is fitted, as usual, to the *left*-hand side of the machine.

Faulty Alignment and What it Means.

If the motor cyclist finds that when the side car is attached the act of steering is rendered difficult (apart from first getting used to the altered conditions), and that even when going

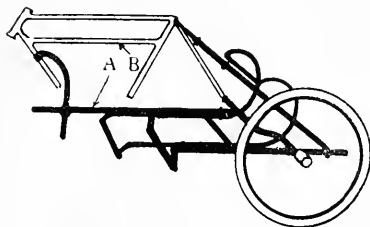


Fig. 8.—The Side Car Frame Member A must run Parallel with the Bicycle Frame Member B.

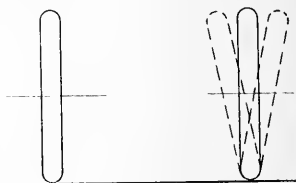


Fig. 9.—The Wheels of both Side Car and Bicycle must Stand Truly Vertical.

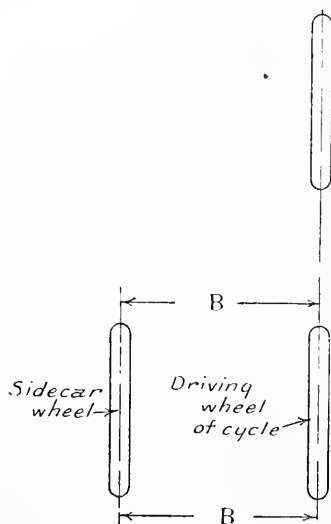


Fig. 10.—The Distances B B must be exactly the same Fore and Aft, and the Wheels as nearly as possible opposite each other.

round corners at a low speed it is difficult to steer a proper course, while on the straight the combination tends to run to

one side of the road or the other unless a " whip hand " is kept on the handlebars, it shows that the alignment is faulty and he should see to it at once. When things are as they should be in this respect the steering, once accustomed to, presents no inconveniences, and if both hands are removed from the bars, the machine and its attachment will run in a straight line for some little distance, while corners may be taken without any trouble, so far as steering is alone concerned. The passenger's weight should come as much as possible on the rear part of the machine, so as to leave the steering free.

Apart from the annoyance caused to the helmsman, faulty alignment means extra strain on the bicycle frame, rapid wear of tyres, and an unnecessary tax on the engine. It must not be forgotten that even in the best of circumstances the side car and its passenger throw some considerable extra work upon the engine, and it is, of course, necessary to take this into account while driving. The throttle opening will have to be slightly increased, and it may not be possible to resort to quite such an advanced position as usual for the spark lever. A lower gear is also required. In normal circumstances, the difference in the conditions is not very greatly felt.

Gearing for Side-car Machines.

Much better results are obtained if the machine is equipped with a variable speed gear, and the driver is saved a lot of fatigue thereby. A free engine clutch alone helps to some extent and even with a single-gear machine, if a suitable ratio be employed (as for instance $5\frac{1}{2}$ to 1, with a $3\frac{1}{2}$ h.-p. engine), a large amount of satisfaction may be obtained. The starting difficulty is sometimes rather pronounced, however, where the machine is of the single-gear pattern with fixed engine, and if one gets stopped on a hill or in traffic it is often rather a hard task to get going again. Hills have to be taken at a rush, and it not unfrequently occurs that the passenger has to be " shed " before the top can be reached.

Some side-car combinations are quite luxurious affairs with their 5—6, or even 7—9, twin-cylinder engines, enclosed side-car body, wind screen, and hood. Such types, equipped with two- or three-speed gear apparatus and other refinements, give almost the same comfort as the small car, while

they are much faster, and in view of lesser width and the detachability of the units can be used in many cases where even the smallest car would be out of the question on the ground of storage difficulty alone.

The "Runabout" type of machine on three or four wheels is gaining in popularity among motor cyclists, but here again lack of stabling facilities puts it beyond the reach of the majority.

In the author's opinion, a rigid type of side car is the best for all-round purposes, and it should invariably be attached to the *left*-hand side of the bicycle, so that in overtaking other vehicles the driver gets first view of the road ahead. The habit of mounting from the right instead of the left-hand side is easily acquired, for, remember, there is no balancing to be done.

Points for the Side-car User.

Except in the very warmest weather the side-car passenger, and especially in the case of a lady, should be urged to wrap up warmly. The difference between riding in a side car and on the saddle of the machine is very marked, it being accounted for principally, of course, by the fact that the glow arising from the engine warms the driver but does not, however, reach the passenger. The author's advice has frequently been ignored by his friends in this respect, but the occasions are numerous on which they have afterwards agreed that it was good advice and have been glad enough to slip on that extra coat or wrap which, in the certain knowledge that it would be wanted, the driver had slipped under the seat cushion, all unknown to the passenger, before starting.

A side-car machine should never be driven "all out," as nothing takes it out of the engine more than this. A head wind retards the machine very considerably, and the best plan is to slightly retard the ignition and give rather more gas than usual, while the gear should, by means of the adjustable pulley, be lowered somewhat if the distance to be covered in one direction against the wind is a long one. Luggage carrying is greatly facilitated when a side car is used, and supplies of petrol and oil can also be taken on board. As a light, handy touring vehicle for two persons, the side-car machine, taken all round, can hardly be beaten.

Lubricating the Engine.

We now come to one of the most important points associated with the driving of a motor cycle, namely—the lubrication of the engine. This is a matter to which the attention of the beginner can hardly be too forcibly directed, for it is one of those things which he too often neglects, with the result that his engine suffers, and he himself may have to dive into his pocket to make good the damage which under-lubrication often entails.

The engine is lubricated on what is known as the “ splash ” system, as a general rule—that is, oil is pumped into the crank-case by means of a force pump, and the flywheels as they revolve pick up the oil and throw it in all directions, so that it reaches the bearings, piston rings, and other parts of the mechanism, which, in this way, receive the necessary lubrication.

The force pump is placed either at the side or within the oil compartment of the tank, and the handle which operates the plunger is within easy and convenient reach of the driver's hand. The frequency with which oil should be injected into the engine is determined to some extent by the work which is being performed and the conditions obtaining at the time, and can only be decided on those lines. At the same time, however, there are rules which are laid down to meet average circumstances, and these should be followed, in the ordinary course of things, while discretion as to what should be done under more stressful circumstances must be exercised by the individual rider.

As a general thing one pumpful of oil every ten to twelve miles, or roughly about every half hour, will be ample when riding solo on average roads, and every five to eight miles when driving with a side car. If there is a strong headwind it may be advisable to lubricate more frequently than this and also if the road is continuously hilly or the work thrown on the engine is for any other reason increased. The worst that can happen through over-oiling is a sooted sparking plug, or the accumulation of carbonised deposits (*i.e.*, burnt oil, etc.) on the piston, cylinder head, and other parts, in a greater degree than would otherwise occur, whereas, if the lubrication is neglected, even to a slight extent, the engine will run hot and the bearings and piston rings will probably

suffer, while, in serious cases, the piston may seize and all kinds of undesirable things happen, bringing damage and expense in their train.

With a new engine it is as well to give two pumpfuls of oil before starting, and to generally err on the liberal side at first, on the road. If blue smoke issues from the silencer you may take it as an indication that there is a surplus and go easy for a time with the pump, but do not be gulled into thinking that it is safe to run long distances without lubricating the engine on this account.

Study Engine Lubrication.

In the next chapter the rider will find some further hints on this branch of our subject, and he should always make a particular point of studying the lubrication of his engine, being assured that he will be well repaid for his trouble in the end. If, when riding, the injection of a charge of oil causes the engine to spurt forward, it may generally be taken that it was being starved a little before, and a second pumpful, or, at any rate, half a charge, may safely be given. Signs of overheating are a falling off in power and speed and "clanking" in the engine. A stop should be made for cooling down, and two, if not three, full charges of oil given. In a way it is better to oil "little and often"—that is, half a charge every so often—instead of a full one at double the interval, as, in these circumstances, the engine gets more evenly lubricated and is prevented from having a surplus of oil at one time and a shortage at another.

Some machines are fitted with automatic lubrication device, by means of which the oil is fed to the crankcase on the drip-feed principle, the flow being constant, although no more oil than is necessary is supplied. Theoretically, at least, this principle is correct, and, compared with the somewhat crude and rule-of-thumb ordinary style, it has some advantages. It is, however, not very widely adopted, although there are signs that it will increase in popularity as time goes on. Of course, the best method of all is that known as forced lubrication, in which the oil is supplied under pressure and finds its way thoroughly into the most inaccessible parts, where it maintains a thin, but constant, film.

Character and Cost of the Lubricating Oil.

Care should be taken to select the right brand of oil to suit the engine. A big powerful engine doing side car work in the summer requires a thick oil capable of standing a high temperature before losing some of its lubricating properties; while a smaller engine, and especially one fitted to a light-weight machine, and especially where automatic inlet valves are used, will work better on a class of oil much thinner in consistency. The makers will usually advise on these points; but if not, let the purchaser consult the manufacturers of the lubricants themselves, who, generally speaking, are always ready to offer the best advice.

If purchased in small-sized tins, the oil costs much more *pro rata* than where obtained in larger quantities, as, for example, 1s. 6d. per quart, 4s. 6d. per gallon, and 16s. 3d. per five-gallon drum.

The author always purchases in the last-named quantity, keeps the drum in the motor shed and draws off into a half gallon tin, from which the bicycle oil tank is conveniently replenished. Unfortunately, it is not possible to adopt the same principle in regard to petrol as the companies controlling the sale of this make no concessions whatever to their customers in the way of a rebate on large quantities. Further, there are restrictions to be observed in respect of the storage of petrol, particulars of which are given in the "Motor Cyclist's Handbook," or may be obtained from the local licensing authorities.

In the event of the motor cyclist running short of engine oil during a journey, he must take the earliest opportunity of obtaining a fresh supply. Sometimes the wayside vendor offers oil from a big drum, which is more often than not labelled with a well-known name. It may be perfectly safe to purchase some of this, but only as a last resort should it be accepted, that is, when there are no sealed cans available. As a rule, also, it is better, when once you are satisfied with a particular brand to adhere to it, and not change about from one to another. Provided that none but the best are used, there is no harm in varying the brands; but there is nothing to be gained by so doing, as before said, when once a suitable oil has been adopted.

It is a good plan to take an extra supply with you if the trip is to be a long one, and a quart tin of the right sort is easily strapped to the carrier, or placed at the foot of the side car. Then you are safe, and need not trouble about the point until it becomes obvious that the supply in the tank has become exhausted—that is, it will be unnecessary to keep an eye on the dwindling supply in the latter receptacle. The number of quart cans full of oil which the author in his long motor-cycling experience has picked up on the road is an indication that riders often do not make sure that the extra tin is tied, or strapped, securely in place. Therefore, make sure on this point yourself.

CHAPTER V.

LIKELY FAULTS AND HOW TO RECTIFY THEM ; ROADSIDE ADJUSTMENTS AND REPAIRS ; RUNNING OUT OF PETROL.

The Fear of " Breakdowns."

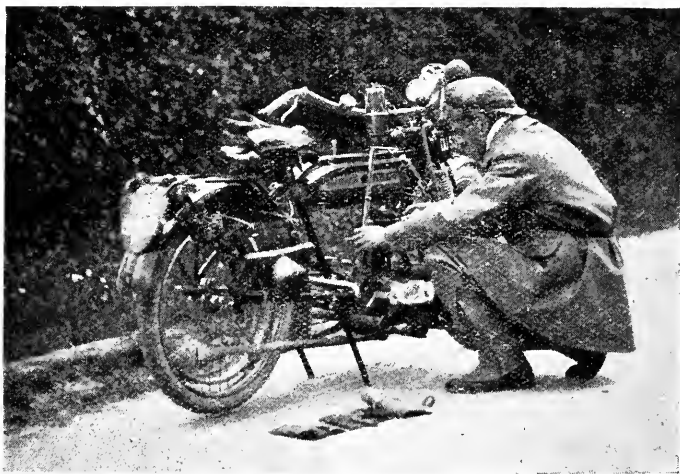
THE prospective motor cyclist is usually troubled with visions of " breakdowns " by the wayside, and it is for fear of these that many people refrain from taking up the sport. In reality, as every seasoned rider knows, these temporary disablements are nowadays few and far between, the modern motor bicycle being a marvel of reliability, and, with ordinary care, it will give long periods of faithful service, with nothing more than an occasional fault, which, as a rule, is very easily put to rights.

Of course, in a piece of mechanism incorporating something like one thousand parts, there are many things which may possibly happen to render the machine, for the time being, *hors de combat*, or put some vital feature of it temporarily out of action ; but—say the uninitiated what they may—the experienced rider knows that, in return for the service it renders, a well-designed and constructed motor cycle gives the very minimum of trouble.

It is the author's intention in the present chapter to lay before his readers some idea of the faults which are most likely to happen when out on the road, and to accompany this by a few explanations as to how the trouble may best be dealt with. A doctor could, if he liked, make one's hair stand on end by conjuring up all the diseases and afflictions which might possibly assail his hearer ; but that would not be to say that the latter would either immediately, or, indeed, ever, fall a victim to any one of them. Similarly, a hundred and one things *may* possibly happen to a motor cycle, the effect of which would be to hold its rider up on the road, perhaps miles from any assistance or means of getting home. Such things have occurred, and will doubtless occur again ; but

every day they get less probable, and no one possessed of ordinary intelligence and his share of grit need be deterred from joining the motor cyclists' ranks because of such a remote possibility.

In days gone by, those of us who took up the pastime before motor cycles were what they are now, it was thought nothing to be hung up for hours, and the author can even now recall at least three "all-nights" out on the lonely road, vainly endeavouring to get going, and, let it be recorded, generally succeeding in the end. Although it may not appear



NOT A "BREAKDOWN."

Mere: y changing the sparking plug—the work of a couple of minutes.

so to onlookers, there is something decidedly attractive about this side of the game, although it is at times difficult to make others understand where the fun comes in. To triumph over a difficulty is always a pleasurable experience, and the remark applies with exceptional force where motor cycling is concerned.

Engine Failures and their Remedies.

The most likely causes of failure by the roadside are usually the simplest ones, and, therefore, the most easy

to detect and put right. The great thing is to keep cool, and take it as a matter of course. In a flurry, you are likely to overlook some little thing that, when collected, you could not very well have missed, and, as a rule, "cussing" is usually accompanied by barked knuckles and a burnt finger, although generally understood to be a consequence only of such eventualities.

If while riding along, and just as you are thinking how well she is running, misfiring commences, it is not always necessary to stop and investigate the cause, as the trouble may disappear automatically, if the engine is kept at it, just as of its own accord it appeared. Of course, it is assumed, for present purposes, that the misfiring has commenced automatically, and independently of anything you may have done in regard to the levers. If the air lever is too wide open, for instance, there may be some spluttering in the engine; but in that case it is but the work of a moment to correct it.

Misfiring is, as a rule, associated either with the carburettor or the ignition appliances, and, before going any further into the matter, these parts of the mechanism should be examined.

If the carburettor is at fault, it may be for one of the following reasons:—

(1) Jet partially stopped up.—Remove jet and clear it by passing wire through.

(2) Throttle or air-slide sticking.—Remove, wash with petrol, and replace.

(3) Mud or dust on gauzes.—Same treatment.

(4) Partial stoppage in petrol pipe from tank to carburettor.—Remove and blow through pipe until obstruction is displaced.

(5) Vents in petrol filler cap of tank and in cap of carburettor float chamber stopped up.—They can be cleared with wire or a pin.

After spending much time seeking the cause of his trouble, a motor cyclist has, before now, discovered that he has run out of petrol. Keep a watchful eye on the tank, and, if going a long distance, it is as well to carry a quart tin of the spirit on the luggage carrier.

Ignition troubles may be briefly summarised as follows:—

(1) Sooted sparking plug.—Remove plug, clean points, and wash with petrol; adjust points, if more than proper clearance between them.

(2) High-tension cable from magneto to sparking plug disconnected at one end.—Remedy obvious.

(3) Wire of cable exposed somewhere, and shorting by touching frame or other object.—Wrap with insulating tape, or, if not available, with string or any suitable covering. Failing this, lead wire in such a manner that it cannot touch anywhere.

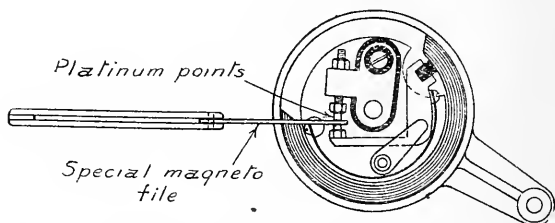


Fig. 11.—A Special Magneto File should be used for Touching up the Contact-breaker Point when latter are Dirty or Worn.

(4) Contact breaker of magneto-platinum points dirty.—Clean them with the file supplied for the purpose, or with a piece of sand paper (smooth), and wash afterwards with petrol. If nothing else handy, rub a visiting card between points, and squirt petrol on them.

(5) Platinum points (or one of them) worked loose.—Adjust by means provided.

(6) Contact breaker sticking.—Remove, clean, and, if needs be, lightly file fibre bush. See that the parts work freely by turning engine by hand with contact cover removed.

(7) Faulty carbon collector brush and terminal.—Remove and examine for cracks or brush working improperly or stuck. If in any doubt, insert the spare terminal which you should always carry.

Ascertain whether there is a good spark at the plug by disconnecting the latter and lodging it on the cylinder, the cable being connected up as usual. Then pedal the engine round, when, if an electric spark occurs (Fig. 12), well and good. If not, remove plug and try another (having, of course, examined the present one first). If second plug also refuses to spark, remove it and hold the end of the cable (that is, the brass terminal) near the cylinder, so that there is only

a slight gap between the two, as seen in Fig. 13. If a spark occurs, it shows there is nothing wrong with magneto, and the plugs are somehow at fault; but if no spark, examine contact breaker as explained above. If you can get someone else to steady the plug or cable while you pedal, so much the better.

Misfiring has been caused before now by valve stems lengthening under the influence of heat. In such an eventuality, either a spare valve must be inserted or the stem of the present one filed down until there is a gap of about the same thickness as a visiting card between stem and tappet, so that the valve seats down properly and is compression tight.

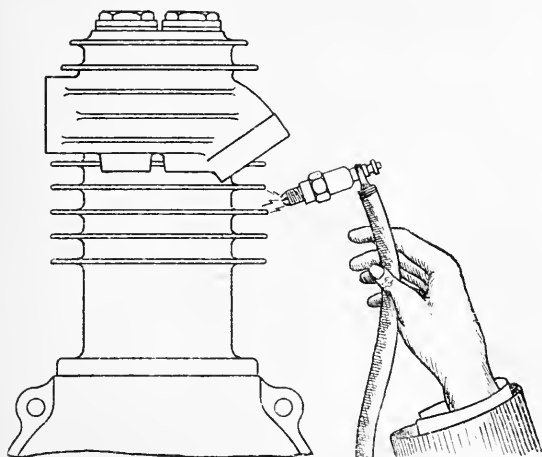


Fig. 12.—How to Test the Sparking Plug. The plug must be lodged on the cylinder, where above method is not possible.

Other Faults and How to Cure Them.

If the engine is a twin-cylinder one, there may be some difficulty at first in discovering which cylinder is at fault. One test is to place the hand against each cylinder in turn, when it will usually be found that one is cooler than the other. It is the cool one that is at fault. Another method is to start the engine up, and, with the blade of a screwdriver, "short" each sparking plug in turn (see Fig. 14), when the point

as to which cylinder is at fault will at once be discovered. Where there has been over-oiling, and the sparking plug has been thrown out of action as a consequence, it is advisable to drain off the oil from the crankcase by removing the plug or screw provided for the purpose, and which is sometimes placed underneath, and, at other times, at the side of the crankcase. Otherwise, the same thing may recur before you have gone very far.

Don't forget, however, that you have denuded the engine of its supply, and that before long it will want another pumpful.

If any hissing sound occurs as you ride along, it may be due to the compression tap on the cylinder having been left, or having jerked, open. It should be closed at once. All

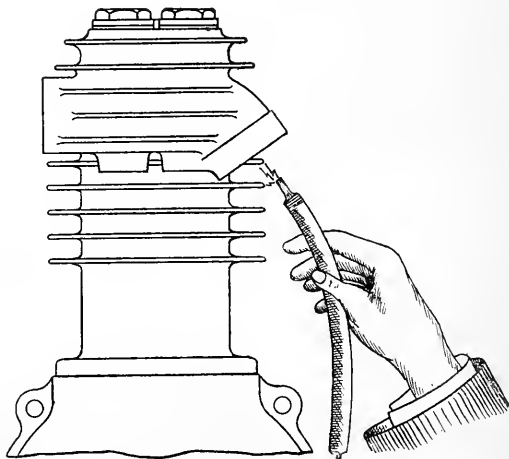


Fig. 13.—How to Test the High-tension Cable.

cylinder jointings, *i.e.*, valve caps, sparking plug, compression cock, etc., must be kept tightly screwed home, or there will be an escape of compression, and consequent loss of power. If the exhaust-valve lifter wire breaks while out on a ride, work on the throttle and keep going if possible until you reach a repairer's shop, otherwise you may have a rare job getting started again, as it is very difficult to push the engine over the compression; but opening the

cylinder compression tap will help you to do this. If you are stopped, there is nothing for it but to try to "jack" the exhaust valve up with something or other (a coin will sometimes do), and then, while pedalling the engine round, knock it out of place after a few revolutions have been made. An acquaintance of the author used to carry with him a disc of metal, in which a hole had been drilled, and to which a length of wire was attached. The wire was handy for jerking the coin out of place when ready to start the engine.

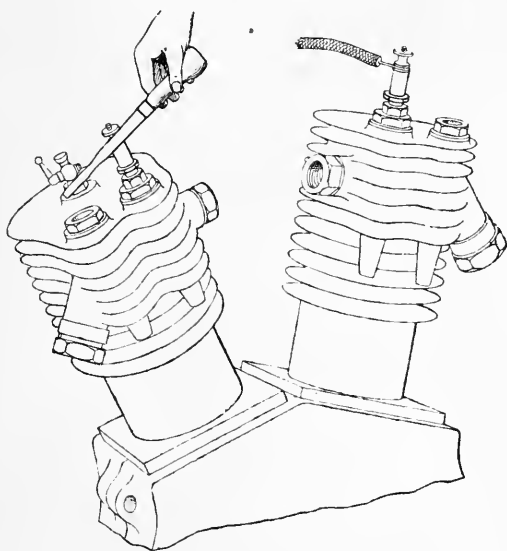


Fig. 14.—The Screwdriver Method of Testing a Sparking Plug. (See text, page 59.)

There have been cases in which one or other of the valve stems has stuck in its guide; but it is a rare occurrence, and can only be put right by allowing the parts to cool down, and then, after squirting a little paraffin over them, remove the valve and clean the stem with emery cloth, or touch it up with a smooth file until it works freely in the guide. If the valve cap proves obstinate and cannot be got to move, a dosing of paraffin first, and then, after an interval has

elapsed, the application of a large-sized spanner will generally do the trick. It may be necessary to give the end of the spanner a smart blow with a hammer before a start can be effected, but care must be exercised, or pieces may be knocked off the cylinder radiating fins.

Troubles Caused by Wet Weather.

On very wet days trouble is sometimes experienced in the ignition department through water getting into contact with vital parts of the magneto. If the latter in its entirety is not protected—as on some modern machines it is—or if the terminals are not of the watertight description, it is advisable to smear the terminals with vaseline, which, for a

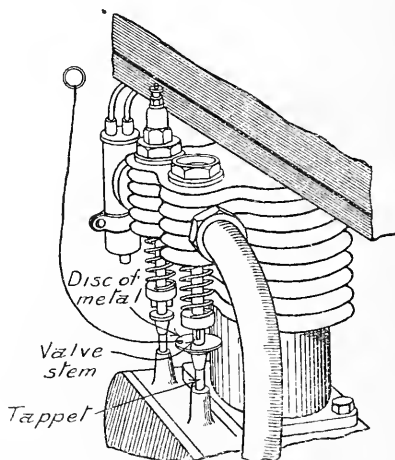


Fig. 15.—When the Exhaust Lifter has Broken. The Disc or Coin is Jerked out of place after Engine has been started. (See text page 61.)

time, at all events, forms a protective coating against wet. Drops of water collect on the high-tension cable connections, or water trickles down the cable itself, and sets up trouble through short-circuiting of the current.

This is only likely to occur in cases where the machine is either left out in the rain for some long time, or is ridden through water or for some hours in heavy rain; and, for

the purpose of obviating it, the accessory dealers sell useful little fitments for the protection of the terminals, which can be bought for a small sum.

Belts and How to Deal with Them.

The belt may give trouble if not properly adjusted, or when it has become much worn. It should always be maintained at a proper tension—not too tight nor too loose, and either a complete spare belt, or a length of a foot or so, with an extra fastener, should be carried. Rubber and canvas belts do not need cleaning, but leather ones do, and the latter must also be scraped and oiled periodically to keep them pliable. Always carry two or three spare belt fasteners of the correct size, and, in addition, a belt punch, also of the right size, for making the necessary hole for the fastener screw when shortening the belt.

If the belt fastener “pulls out”—that is, comes away from the belt owing to the latter giving way where weakened by hole cut for the screw—the damaged end of the belt must be cut away, a fresh hole made by means of the punch, and that half of the fastener connected up again. In doing this, first place the half-fastener alongside the end of the belt, and see by this exactly where the hole should come, so that the hooked end of fastener will clear the belt without its being necessary to cut any more off after the hole is made. This simple precaution saves a second paring of the belt, and reduces the extent to which the latter is shortened.

If when all is completed it is found that the belt is too tight, the best plan is to adjust the pulley flanges until the tension is eased a little. Of course, this means a slight lowering of the gear ratio, but better that than have the belt break again. Besides, a very tight belt puts an extra strain on the pulley-shaft bearing of the engine, and interferes to some extent also with the free running of the engine.

It will be found easier to get the fastener connected up if it is placed crosswise of the belt when being fixed, and is afterwards pushed into its proper position in line with the run of the belt. This does away with all binding while the screw is being fixed in place, and facilitates the operation pretty much. Care should be taken in drilling the hole for the fastener screw to see that it is *central*, and unless the punch is of the correct size, so that it conforms to the outline of the

belt, it is quite easy to get the hole out of centre, with the result that the belt soon gives way, because its thickness has been reduced too much on one side. Using a 1-in. belt punch for a $\frac{3}{4}$ -in. belt, for instance, makes it difficult to get things even, so, with a view to avoiding this trouble, see that

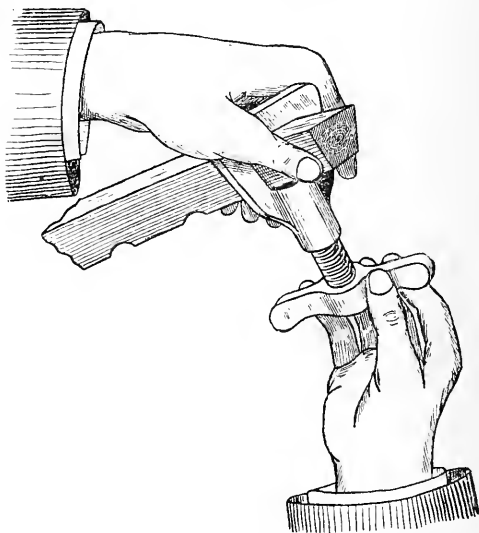


Fig. 16.—Use a belt punch of the right size and keep it central when drilling the hole.

the punch and the belt match as to size. If the fastener is too much to one side, it may scrape against the pulley flange, and in time wear a groove in the latter.

Belt Slip and Cures for Same.

Belt slip is a dreadful nuisance. If caused by slackness alone, the remedy, as shown above, is simple ; but if because of wet, or the pulley flanges are worn to an incorrect angle, the bother is much more difficult to get rid of. When the pulley flanges are very much worn the belt may even sink to the bottom, and the result will be permanent slip or "bottoming," as it is called. There is no proper cure for this but a new pulley, although if matters have not gone too

far it may be possible to true the flanges up in the lathe. On a very wet day the belt may slip a good deal, and a halt must be called for the purpose of drying it and mopping out the pulley and belt rim. This is where the chain or shaft-driven motor bicycles hold the advantage; but, taken all round, the belt drive, with its flexibility and simple directness, has much to commend it.

If the motor cycle is chain driven, there is, of course, a chance of a link snapping. This is not an alarming matter, provided the motor cyclist carries some spare links and half links, and has at his disposal one of the special tools sold for making repairs of this kind.

Slipping Clutches and How to Deal with Them.

Riders of machines fitted with free engine clutches experience trouble on the road sometimes owing to the clutch slipping. In such a case the parts must be adjusted by the means provided, and if a cure cannot be effected thereby, it may do some good, in the case of a multiple-plate clutch, to inject paraffin to free the plates.

If a leather-to-metal clutch is used and it slips, in spite of the adjustments which have been made, it may be because of too much oil. Any substance like fullers' earth may be used to restore the frictional contact between the parts. If caused by the leather or other composition having become hard and shiny, either a new leather must be fitted or the present one treated so that its effectiveness can be regained. A dressing of Collan oil after scraping will often render the band pliable again, but an interval of some hours must be allowed to elapse between the application and the re-mounting of the leather in place, and all surface oil must have drained off. Road dust may be employed in an emergency to get the parts to bite.

Running Short of Petrol.

Sometimes the engine of a motor bicycle runs erratically when the level of the petrol has become very low in the tank, and it will immediately improve if the tank-filler cap is removed so that air may enter and exert a pressure on the surface of the petrol, and force it down the pipe. In this way a distance of a few miles may be covered when only a very small quantity of petrol remains and the engine has been

misfiring as the spirit washed to and fro, covering the pipe opening one moment and uncovering it the next. Another dodge is to run the front wheel of the machine up a bank or on to the path so as to cause the petrol to flow towards the rear and down the pipe to the carburettor. This may have to be repeated every now and then for a mile or so, but it often enables the rider to reach a source of supply when

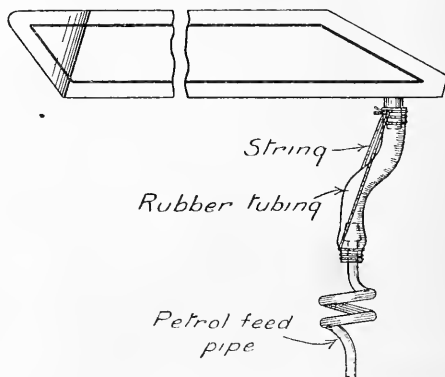


Fig. 17.—A Leaking Petrol Union and Pipe can sometimes be Temporarily Repaired by the above means.

otherwise he would have been stranded by the roadside. Sometimes, when only a very small quantity of petrol remains, another mile can be extracted by pressing a finger on the plunger of the carburettor float chamber and blowing into the tank. The opening in the latter must, however, be entirely covered by the mouth.

Always insist when taking in petrol at a garage that a proper gauze-lined funnel is used, otherwise you may get some foreign particles in the tank which will later on choke up the jet of the carburettor. Moreover, this safeguards you against getting water in mistake for petrol, as water will not pass through the meshing of the gauze.

Leaking Petrol Pipes and an Impeded Flow.

In the event of the petrol feed pipe leaking or the nipple coming adrift, there is a possibility of repairing it with a binding of insulating tape, or, failing this, the tyre-repair

outfit may be drawn upon for the materials with which to effect a temporary repair. If the pipe is broken and the vibration causes your repair work to break away, a piece of string may be pressed into service to act as a stay or bracing (see Fig. 17). When the string has been tied at one end to the pipe, it should be led upwards and fastened securely to any convenient part of the frame or tank. This steadies the pipe and keeps it from shaking loose. Where a repair proves impossible, use the rubber tubing of the acetylene headlight as a makeshift for the pipe; but get a repair effected at the first motor shop you pass, as rubber soon deteriorates under the action of petrol and if you rely on it you may be let down again before long.

What is known as "air-lock" sometimes occurs in the petrol tank or pipe. This usually follows accidental blocking up of the aperture in the filler cap. The carburettor float chamber will be found denuded of petrol although there is plenty in the tank, and on disconnecting the pipe and turning on the tap it will be found that either no spirits comes through at all, or else there is only a spasmodic dribble. The remedy is to clear out the hole in the filler cap, and also to blow through the pipe, after disconnecting it at both ends. Also see that the hole in the carburettor float chamber cap is clear.

In cases like this the engine suddenly misfires and then stops altogether for want of petrol, but, on removing the petrol tank filler cap, it starts up again at once, and will run so long as the cap is not replaced. There is no need, however, to go on in this way, and the waste of petrol through splashing is great. The proper procedure is that described above.

Serious Troubles are Rare.

Accidents to the timing gears of a motor cycle do not often occur on the road—indeed, they are exceedingly rare. Should one be so unfortunate, however, as to experience something of the sort there is little that can be done at the roadside unless a set of spare gears is carried—a thing which is not in the least necessary because of the remoteness of the chance that they will ever be wanted. Even though available, they could hardly be fitted, away from a workshop, by an amateur.

The author once experienced trouble of this kind and spent some hours on a winter Sunday afternoon filing up the teeth of gear wheels, which had been damaged by a washer.

which broke in half where recessed to take a split pin, the parts falling in between two gear wheels while the engine was running at speed. On first dismantling the gears, a repair looked hopeless; but patience and one or two good tools managed the business, and a distance of fifty miles was afterwards covered late at night, the destination being Coventry.

On another occasion the engine slowed down somewhat mysteriously, and would not restart. There were plenty of explosions in the silencer, and other indications that the mixture was getting through and the spark was there to explode it. On testing the spark advance it was found that the gear wheel or pinion mounted on the end of the magneto armature shaft had worked loose, and had completely upset the timing of the magneto. Once having made this discovery it took but a very short time to make the pinion fast again on the taper seating and re-time the magneto. This, again, was a thing which might happen once in a lifetime, but the possibility of its so doing is present where the method of fixing the parts is of the kind described.

Carburettor on Fire.

On one or two occasions the author has had the carburettor catch on fire both when riding and when preparing to start. In these circumstances, if the fire cannot be immediately got under, no time should be lost in getting the engine running, either on the stand or along the road, the petrol tap having been closed at the first possible moment and before anything else whatever is attempted. If only the engine can be started the petrol in the float chamber will quickly be exhausted, and there is an end of the fire. In the meantime throw sand, road dust, or a mat over the machine, and beat the flames with your cap or anything else that is handy. Water only spreads the flames; therefore, in no circumstances should it be employed. If the engine cannot be started up the supply of petrol, to feed the flames, lasts longer, and in case the reader may be a little sceptical as to the possibility of starting the engine under such circumstances, the author can bear testimony to the fact that, on at least three occasions, this has been done either by himself or others in his presence, and, once in particular, after all hope had been abandoned of saving the machine. His advice, therefore, is at all costs get the engine going.

Take Care of the "Bicycle Parts."

It is hardly necessary perhaps to point out that the bicycle parts of a motor cycle must be kept properly adjusted, wheel bearings lubricated, and so on. They run at much higher speeds on motor than on pedal cycles, and require at least as much attention. See that the cones on the axles are properly set so that there is no side play, or tightness, of the wheel ; keep a watchful eye always on the condition and adjustment of brakes, steering head, and other important parts. Every one of the principal nuts should be gone over with a suitable spanner occasionally, and the main adjustments tested. Further remarks on this point will be found in the concluding chapter.

CHAPTER VI.

TYRES AND TYRE TROUBLES; CLOTHING AND LUGGAGE CARRYING; THE TOOL KIT; MANAGEMENT OF ACETYLENE LAMPS; DRIVING IN BAD WEATHER; THE COST OF RUNNING A MOTOR CYCLE.

The Important Question of Tyres.

As with the pedal cyclist, so with him who rides a motor cycle, the puncture fiend is always hovering near. Some people seem to think that it must be a dreadful job repairing a motor cycle tyre; but, as a matter of fact, although the tyres are much larger, the task is not a bit more difficult or laborious on that account. In the majority of cases the tyres are of the beaded-edge variety, and quite easy to get on or off. Stouter levers and a rather more elaborate—or, at any rate, stronger and more expensive—repair outfit are required; but unless the cover is a bad fit, or unusually tight, it is quite as easy to deal with it as one fitted on a pedal cycle wheel.

Cheap tyres are of no use on a motor cycle. It is better by far in every way to pay more at the outset and have really good quality and stoutly made tyres, such as may be obtained from any of the first-class firms manufacturing this class of goods. In the end, it comes cheaper to fit the higher-priced tyres, and the same remark applies, although, of course, in a smaller degree, to the repair outfit. Let this also be of the best, otherwise you may suffer many annoying delays which might have been avoided by purchasing a slightly more expensive outfit. Inner tubes are supplied either with butt ends or open-ended, instead of, as usual, forming a continuous or endless tube. The purpose of this is to enable the motor cyclist to remove the tube altogether from the wheel, so that it can be more conveniently repaired by the roadside or taken indoors for the purpose, without having to stoop down by the wheel, in which position one's movements are naturally hampered. More important still, a new tube can be inserted,

if necessary, without having to remove the wheel from the frame, and it is often quicker, when a puncture occurs, to change the tube and leave the repairing operation until you have arrived home again.

Always place plenty of French chalk in the butt end when joining up a tube of that description, or, if it is an open-ended tube, use the special lubricant supplied by the makers, so that there may be no leakage at the joint in the latter, and no chafing in the former, case.

Repairing (and Preventing) Punctures.

The author is a great believer in puncture-proof bands of the kind intended for insertion between tube and cover. Having used these now for some considerable time without experiencing a single puncture—although, on two occasions, bursts have occurred—the effectiveness of this device is, in his opinion, beyond question. The bands are made of highly-compressed and very good quality rubber, with their edges finely chamfered off so as to form a snug fit at the sides. They require no fitting whatever, and do not slow the machine perceptibly. The particular bands used cost 12s. each, and, in the circumstances, they are well worth it. Here again, cheap makes are of little use, and unless the bands are endless, they are likely to cause trouble by rucking up and throwing the outer cover of the tyre off the rim.

Never be in too much of a hurry when repairing punctures. It is fatal to good and lasting work. The patches are much thicker than ordinary ones, and the solution should be put on in two applications, and allowed to nearly dry before fixing on the tube. Then use a fair modicum of French chalk, and make sure, before finally inflating the tyre, that the tube is clear of the beaded edges and the cover is fitted properly all round. The beaded edge should first of all be pushed into place when refitting the cover, an inch or so on each side of the valve before running it on elsewhere, and, in a properly fitting tyre, it is possible, after a little use, to get the complete cover on without employing tools, except perhaps for the last few inches, which always require more effort than the rest. More often than not, however, the whole operation can be effected with the hands alone.

It is not a bad plan to fit chains or other kinds of nail-catchers, stretching across, or suspended from, the mud-

guards, to catch, and throw clear of the tyre, nails, thorns, or other puncture-producing objects, which, if pressed between wheel and road, will, more likely than not, bring about deflation of the tyre.

Further Tyre Considerations.

Keep the tyres pumped up hard at all times, and never neglect to repair, at the earliest possible opportunity, gashes or other damage which you may notice in the covers. Special plastic preparations are sold for this purpose. The number of different tyre treads offered to the motor cycling public is legion. Some are good, but others practically of no use as non-skids. Steel-studded tyres prevent slipping on greasy roads, but on dry, dusty ones, with a loose surface, they are very prone to induce that evil. A first-class tyre, with rubber studs or other similar projections, is, perhaps, the best for all-round purposes; although a combination type, *i.e.*, one having both steel and rubber studs, is very lasting, and acts very well as a non-skid.

Before replacing the inner tube, be sure to run your fingers round inside the cover to make sure that the puncturing instrument is not still projecting. Neglect of this simple precaution usually leads to immediate further trouble—that is, the moment the tyre is pumped up again. Valve trouble is not often met with in motor cycle tyres, and, if it is, a cure can usually be effected at once either by fitting a new rubber or tightening up the shallow nut at the base of the valve, and which holds the latter in place and prevents it from turning about in the tube.

Most of the foregoing remarks apply to pedal cycle as well as motor cycle tyres, and the average reader will have no difficulty, therefore, in judging of their correctness.

Motor Cyclists' Clothing.

The clothing question is an important one with the motor cyclist. He must provide himself with the necessary protection against wet and cold, and in this country, except in the height of the summer, one can never really count on being safe from either. The greater speed of the motor cycle, and the fact that the rider is not called upon to exert himself as he passes rapidly through the air, make it necessary to wrap up more than is usually done when cycling, and the best plan is

to clothe oneself according to the weather conditions prevailing at the time, and carry some slight additional protection in reserve.

A good stout macintosh overall suit, preferably of double texture, is required for most occasions, and under this an ordinary or cycling suit of medium texture (but thicker in winter) should be worn. Holland overall suits are sometimes donned in the summer, and while clean, they look very nice. For very wet days, oilskins and a sou'-wester may be required, but not unless the ride is a long one and the rain continuous. Gauntlets and stout boots are advisable, and goggles should always be worn as a protection for the eyes against dust and flies. Leather suits have gone somewhat out of favour with the modern rider, but they have their advantages, although perhaps not looking quite as smart as the other kinds of dress. A leather waistcoat is a very useful garment, and that provided with sleeves should be selected, as giving greater protection in cold weather.

In this matter of clothing, much depends upon the individual rider's constitution and tastes, and, after a little experience, he will be able to gauge his own requirements in this direction.

Importance of a Good Tool Kit.

The tool kit is an important feature of the motor cycle equipment. It should contain the articles most required, with a few extras thrown in. Spare parts should also be

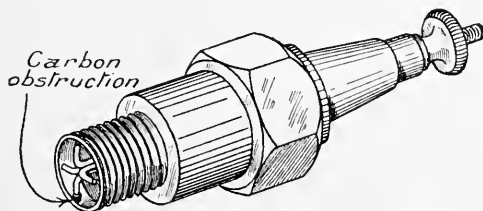


Fig. 18.—If only one of the Sparking Plug Points gets filled in by a Carbon Obstruction it suffices to render the plug inoperative.

carried, and it is advisable to pack the heavy articles away from the lighter and more easily damaged ones. The author

has three receptacles on his machine—one for heavy tools, etc., and another for lighter tools and spare valves. The third, a small bag strapped to the handlebar stem at the back, contains easily-damaged articles, such as sparking plugs, carburettor jets, magneto parts, and so on.

If the following list is perused, and the articles mentioned therein are included in the tool kit, it is unlikely that the rider will, in the case of any ordinary mishaps, find himself "out" of the article he requires:—

A large-sized adjustable spanner.

A smaller ditto.

The spanners and other tools supplied with the machine.

Pliers (combination type), and another pair (quick-grip type).

Belt punch and knife.

Screwdrivers (one small, other larger).

A coil of copper wire, insulating tape, file, high-tension cable, and a selection of assorted bolts, nuts, split pins, washers, etc.; two or three spare sparking plugs, spare magneto parts (*i.e.*, contact breaker, platinum points, carbon brush and holder, and bell crank, or, if going on tour, a complete contact breaker disc).

Spare belt, two or three belt fasteners, butt-ended inner tube for tyre, large repair outfit for ditto, tyre levers and valve rubber.

A complete inlet and exhaust valve for engine.

Spare carburettor jet.

Carbide, and a spare lamp burner.

All this equipment can be conveniently packed away in the bags usually provided with the machine; but if not, an additional valise can be purchased at a moderate outlay. Make sure, however, that the latter is strong, and fitted inside with a metal lining or framework. The spare tube and belt, and particularly the former, are best carried in the special circular bag sold for the purpose. It is very annoying to find, when you come to insert the spare tube, that it has been chafed through and must be repaired before it can be used.

A visit to a firm of accessory dealers or a look through their lists will serve to help the beginner in fitting himself out and equipping his machine. It is quite easy, however,

to spend a lot of money in this way, and some of it unnecessarily ; but, if one goes to a really first-class firm, he need have no fear of being persuaded, against his will, to spend more than he wishes to or can really afford.

The Lamp should be a Good One.

The lamp question is an important one with the motor cyclist, and here again he should avoid the very "cheap" production. Let the headlight be the best you can afford to buy, and, having got it, treat it properly, and it will repay you by giving a good and continuous light. This is in the highest degree necessary, in view of the increased speed at which motor cycles travel. Cleanliness is next to godliness, where acetylene lamps are concerned. The old carbide should be thrown away after a ride in which the lamp has been lighted for any length of time. The container of the generator usually holds sufficient for a continuous light of about four hours, and it is better to place only just so much carbide in it as will be likely to last the length of time required. On the outside of most generators will be found a mark to indicate the height to which the carbide should be filled, and it is worse than useless to pile it up above this level. Under the action of the water the carbide swells, and is likely to choke the passages, while the space in which the gas generates is, of course, restricted, and the light-giving properties of the lamp suffer as a consequence.

A new charge should be given for each trip, but much of the carbide used on the previous journey may be found, on examination, to be in good condition, and should, in the interests of economy, be reclaimed and placed in the generator along with the fresh charge. Its presence there will assist to generate gas almost immediately when the water is turned on. Riding all day with the carbide jolting about in the container has the effect of reducing much of its bulk to powder, and it is a better plan to carry the carbide in a package stowed away in one of your pockets. Make sure, however, that the package is air-tight, or you may be reminded of its presence by the very unpleasant smell which rises from carbide when in contact with air or water. Moreover, you will be an unpopular figure wherever you go, and especially when in the company of others indoors.

Management of Acetylene Lamps.

The burner should be kept clean, and also the gas duct between it and the generator. Any partial choking of either interferes sadly with the light. A packet of fine wires for clearing out the diminutive holes in the burner can be obtained from any dealer, and make sure you have the right-sized burner and a good lens mirror in your lamp. The separate generator type of lamp is the most convenient in use, and for inspection purposes at night carry a small electric torch, which is not only safe to use but very handy into the bargain.

Always turn off the water valve of the acetylene neadlight shortly before the end of the journey is reached, and put the light out altogether before the flame gets too low, otherwise the burner may get choked with carbon. Do this by pinching the rubber tubing, and not by opening the front of the lamp and blowing out the flame. Make sure there is water in the container, and, when lighting up, give the valve handle which controls the supply two or three turns. Directly you hear bubbling or hissing, apply a lighted match to the burner. At first the flame will be mainly a blue one, with practically no light-giving properties, this being caused by the escaping air ; but in a moment or so, if all is in order, the flame will spread and assume its wonted brilliancy.

If difficulty is experienced in getting the gas to form, remove the carbide chamber, and turn the water on to see whether it is actually dripping through. If it is not, remove needle valve altogether by unscrewing knob or thumbscrew, and pull upwards. Water will now probably flow through rapidly, and if it does, replace needle valve quickly or you may lose all the water. If, on the other hand, no water appears, push a piece of wire, or the pointed end of valve itself, upwards into the opening, when the obstruction to the flow will almost certainly be dislodged. Of course, if you have forgotten to fill up with water, none will come through, and in that event let us hope you will be near a source of supply.

Acetylene gas sometimes takes a long while to generate, and in such a case you can generally expedite matters by removing the rubber tubing at the generator and blowing down the orifice of the branch over which the tubing is placed.

The law requires that you should show a light on your front number plate at night time, and it is not sufficient that

the lamp throws a strong beam in front of the machine. It must illuminate the number plate as well. To be exact, "one or other" of the number plates must be lighted, but it is always the front one on a motor cycle.

Some lamp brackets supplied to motor cyclists are much too weak for their work, and after a little while they break and let the lamp down on to the road, perhaps when you are travelling fast. Considerable damage may result, and it

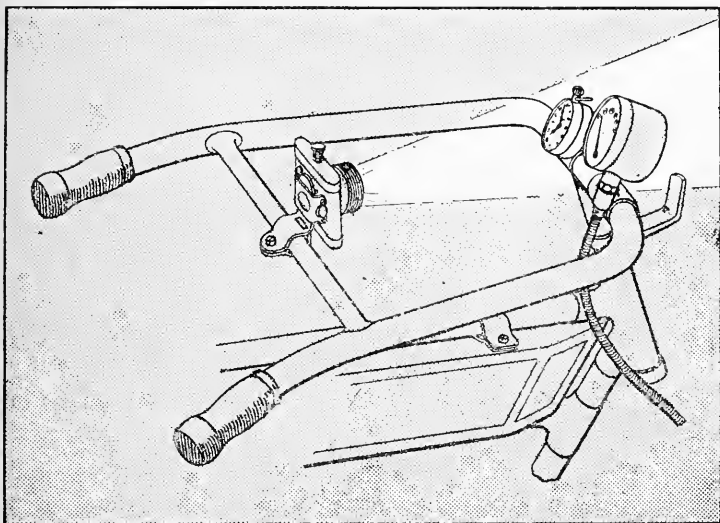


Fig.-19.—Lamp Attachment for Reading Handlebar Fittings at Night.

therefore behoves the purchaser of a lamp bracket to insist on having one which is capable of supporting the weight it will have to carry, and to withstand the strain of the continuous vibration to which it will be subjected.

Saddles and Accessories.

A good saddle is an all-important feature. It should be on the large side, and springy, without tending to roll or bounce. In one or two cases the springs are of varying strengths to suit riders of different weights, and, in purchasing

one of these, make sure you are getting the right one for your particular weight. The figures are embossed on the leather flap of the saddle, and should be examined before purchasing.

A speedometer on one side of the handlebar and a watch on the other add greatly to the pleasure of riding, as, with these instruments before you, it is possible to judge at what speed you are running and know what o'clock it is without having to take a watch out of your waistcoat pocket.

The horn, or hooter, should be a good one, capable of giving a loud, penetrating note, and unless it has a good, substantial clip for attachment to the handlebar, have nothing to do with it, but buy one which possesses this feature.

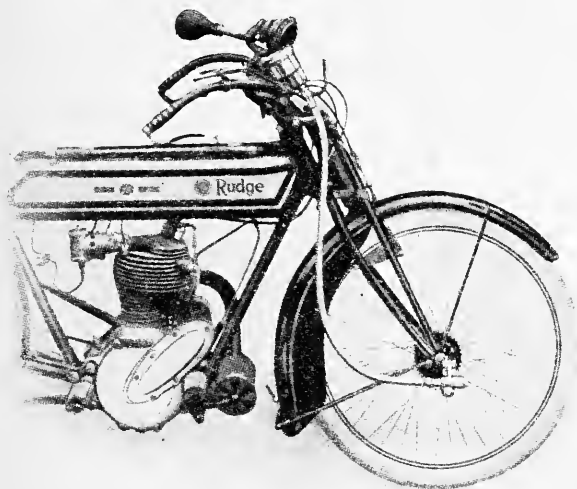
Luggage Carrying and Wet Weather.

A fair amount of luggage can be accommodated on the carrier behind the saddle ; but if anything like an extended tour is contemplated, it is best to send a bag on in advance from place to place. Of course, when a side car is attached, luggage-carrying is greatly facilitated. In any case the rider should, when on tour, carry with him a partial change of clothes, in case of being held up short of his destination for the day by very bad weather. The author has, on one or two occasions, been caught in this way, being compelled to ride a distance of some miles in a soaking downpour before reaching shelter, and has been very glad to turn to the dry clothing contained in a stout bag with waterproof covering on the carrier, and without which the discomfort would have been greatly accentuated. Only when out on tour is it necessary to hamper oneself with spare clothing ; ordinary rides (even long-distance ones) not calling for such precautions.

When the mud is very bad, the holes in the silencer may get choked up in the course of a long ride, and the engine will perform indifferently, especially on hills. It will get hotter than usual, and even display signs of overheating—that is, knocking on the slightest provocation, and generally running below par. Rain and mud also interfere with the running of the belt, and get on the magneto terminals, with the results referred to in an earlier chapter, in which the remedy was also given. Taken all round, a motor cycle will perform remarkably well as a rule, in the most adverse conditions of weather, and can safely be classed as an “all-weather” vehicle, no matter what may be said to the contrary.

The Cost of Motor Cycling.

Many people imagine that it is a dreadfully expensive business to run a motor bicycle. It *can* easily be made so ; but if ordinary care be exercised, the expenses may be kept down very low in comparison with the advantages offered. Petrol costs 1s. 6d. per gallon at the time of writing in most districts, this being an unusually high figure. Anything from 60 to 120 miles or more can be obtained from the gallon accord-



THE FITTING OF A SPEEDOMETER.

A Speedometer is not only necessary to enable the rider to observe the legal limit, but adds greatly to the interest of driving the machine.

ing to the type of machine and the work it has to do. With ordinary luck, the repair bill does not amount to much, and engine oil is one of the cheapest items—a quart should suffice for anything from 180 to 300 miles.

The tyre bill is about the largest item, as a rule, and belts have to be renewed fairly frequently. Depreciation is much less rapid if care is taken of the machine ; but it depends very largely indeed upon this, and the rider himself must decide as to what amount of care and attention he will give to his

mount. Neglect and misuse always rebound on the perpetrator, and hit him in a vulnerable part—to wit, his pocket.

In the next, and concluding, chapter, will be found a few remarks on the subject of the care of the machine in the motor shed, and it is hoped that any motor cycling beginner who may read these pages will give them attention. If care in the motor house is supplemented by the same virtue when out on the road, the machine will, as a rule, render long and faithful service, and cause its owner the minimum of trouble and expense.

Overhauling the Machine.

Before a long ride, go over the principal nuts, etc., with a suitable spanner, lubricate the wheel bearings, steering head, etc., and make whatever adjustments you find necessary in other directions. Much better do this before starting than to have to spend time on the roadside making good what should have been done before the journey commenced.

The preceding remarks will be the better understood by the reader who, although as yet quite inexperienced, has at least made one or two trips on a motor cycle, than by one whose first ride is still a thing in store, and they must be accepted as indicating the lines upon which the reader should proceed, rather than as laying down a definite series of rules which will apply with equal force to each type of machine and every differing circumstance. They are intended to meet average needs, and apply to general conditions, and as such it is hoped they will be found useful by all who take up the fascinating sport of motor cycling.

CHAPTER VII.

THE LAW APPLYING TO ROAD USERS ; REPAIRERS AND GARAGING ; RAILWAY REGULATIONS AS TO THE CARRIAGE OF MOTOR CYCLES BY TRAIN ; ATTENTION TO THE MACHINE IN THE SHED.

The Legal Aspect of Motor Cycling.

A FEW of the points associated with the use of a motor cycle over which the law exercises control have already been remarked upon in preceding chapters. They have, however, referred in the main to the preliminaries which must be observed before the machine can be used on the public highways, and we may now turn our attention for a moment or so to other aspects of the same subject.

It is hardly necessary to say that the motor cyclist should always carry his driving licence with him when riding his machine. It is the easiest thing in the world to leave it behind, in another jacket, and therefore the best way is to carry it in one or other of the bags attached to the machine itself. The law provides that the licence must be produced if demanded by any police constable, and failure to comply with this regulation means a fine in 99 per cent. of cases.

It is illegal to ride the machine on a public road unless the registered numbers are exhibited at front and rear, and if the machine is sold and another purchased the registration authorities must be informed so that the number may be transferred or new ones issued. A fee of one shilling in the first case, and five shillings in the second is payable before things are in order. It is unnecessary to carry a separate number plate on the side car, but if a trailer is used it must bear a number—the same, of course, as that on the bicycle itself.

A maximum of 20 m.h.-p. is allowed on the open road and wherever no special regulations as to speed are enforced. Ten-mile limits abound in great profusion in all parts of the country, and care should be taken to observe them. Riding

to the common danger, "or in a manner dangerous to the public," may be interpreted by the local police to mean anything from five miles (or less) per hour upwards, according to the circumstances of the moment; the number of people about, and so on. It is a fallacy to imagine that because you are keeping the speed down *below* that of the prescribed limit through a town, you are safe. The offences just indicated may possibly be alleged against you when running at only half the speed locally enforced.

If stopped for exceeding the speed limit outside of a town the police must either warn you at the time, or within three months, of their intention to prosecute. If no such notice is given and you are subsequently summoned, it is as well to urge the point in defence, although, in the majority of cases, it will not avail you much.

Every motor cycle is by law required to carry two separately controlled brakes, each capable of holding the machine by itself. If the machine is left unattended by the roadside, steps must be taken to prevent its being started by others.

Make free use of the hooter if there are many people about, otherwise, should you unfortunately collide with anyone, it will be a strong point against you that you did not give audible warning of your approach. The noise of the engine working is not recognised by the law as a means of warning.

"Motor Repairers" and Garaging.

A few words, now, upon the subject of repairers and garaging may not perhaps be out of place. There are to be found in all parts of the country so-called repairers who are quite obviously incompetent to deal with important engine repairs. So long as the work is confined to the bicycle parts they may be trusted to make a good job of it; but if it is anything to do with the engine or its appurtenances, it is advisable to keep a very watchful eye on the methods they adopt in dealing with the trouble. On the other hand one often comes across a really first-class man, even in a small country village, and it is not long before one can judge of his capabilities, if only by the way he handles his tools and generally goes about the task. The author in no way desires to cast any unfair reflection upon repairers as a class, but he has known

of many cases in which considerable damage has been done to motor cycles by unskilled workmen, calling themselves motor engineers, and it is, therefore, deemed necessary to warn readers who are only themselves serving their novitiate to be as careful as possible in entrusting work of this kind to others.

If it is desired to garage the machine for a night, or longer, ask the garage proprietor or his representative what the charge is for so doing. Usually one shilling per diem is asked or one shilling and sixpence for a side-car machine, but on occasions more is demanded, and the attempt to extort it should be resisted by the owner of the machine. A receipt for the bicycle should always be taken, and it is a good plan to attach a label bearing the owner's name. Before leaving the machine note the amount of petrol in the tank and turn off the tap. It is not suggested by this that garage men are dishonest, but rather that the carburettor sometimes leaks unawares, and, in any case, it is a good habit to cultivate this watchfulness on the petrol and the rate at which it is used up.

The Carriage of Motor Cycles by Rail.

At times—although, as a rule, very seldom—you may require to convey your motor bicycle by rail. The railway regulations must be carefully observed, however, when doing this. All petrol must be run out of the tank before the machine is taken into the guard's van. This is a primary rule which the owner should rigidly observe in his own interests. When taking the machine by train, and you yourself are a passenger, see it personally into the van after attaching to it a label bearing your name. It is well worth while to tip the guard and personally assist in getting the machine both on and off the train. Remove the belt beforehand, and tie or strap it securely to the machine, and if there is a variable gear handle strap this also, in a fixed position, so that it cannot be moved by inquisitive porters and others.

The charge for carriage, accompanied by passenger, ranges from 1s. for a distance not exceeding 12 miles to 12s. for 450 miles. Speaking generally, the cost averages 6d. per 25 miles as the distances beyond the first 100 miles advance, and 1s. per 25 miles below that distance; and if unaccompanied, double this is demanded. When consigning the bicycle

by train and not travelling yourself, be sure to send it at company's risk, for which, of course, you will have to pay a little more. If sent in a crate by goods train the charges are much less, but the time expended in getting through to destination is necessarily longer.

You have to sign a declaration before putting the machine on a passenger train, to the effect that there is no petrol in the tank, and time should always be allowed for this purpose, otherwise you may possibly lose the train.

We now come to the last part of our subject, *i.e.*, the care of the machine at home—that is, in the motor shed or house—a very important consideration indeed.

Care of the Machine at Home.

Emphasis has already been laid upon the necessity of keeping a watchful eye upon all the most important nuts, which should be tested periodically with spanners which actually fit and are capable of putting the required pressure on the nuts to ensure their being really tight. The cylinder holding-down nuts; those holding the wheels in place, and the saddle-pin and steering-head nuts should always be kept tightly screwed up, and, indeed, every nut and fastening about the machine should be looked to occasionally. Do not neglect parts which are not accessible without entailing a little inconvenience—make sure that the pulley nut has not worked even a trifle loose, and that there is none but the slightest perceptible amount of side play in the axle cones of the wheels.

Motor cyclists are, it is to be feared, somewhat prone to neglect the “bicycle” parts of their machines, but it is unwise on their part to do so, and, after all, the amount of time and labour involved is as nothing compared with the increased satisfaction which the resulting immunity from trouble affords. Loose or broken spokes should be looked out for and, if discovered, tightened up or replaced at the earliest opportunity. The lubrication of the hubs and other parts is a matter which needs regular attention, and the best medium for the purpose is the “Hub Lubricant,” sold by one of the best-known firms of motor oil manufacturers. Ordinary cycle oil is not suitable for motor bicycle wheels on account of the greater speed and larger wearing surfaces.

The Engine Repays Careful Maintenance.

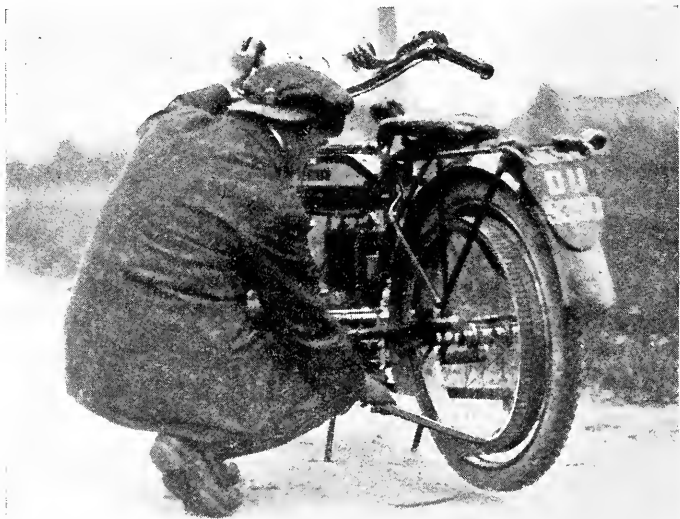
The engine should be looked carefully over in the motor house, and the compression joints tightened up at once if found the slightest bit slack. The cylinder, crankcase, and contingent parts should every now and then be cleaned with paraffin, and a stiff brush (preferably one with steel wires instead of bristles) is the best for the purpose. Accumulations of oil and dust not only make the engine look untidy and ill-kept, but interfere with the dissipation of heat and generally react against efficiency. The machine as a whole should be rubbed down after a ride in the wet, or when in a dirty or dusty condition. On returning from a ride of any length remove the drain plug at bottom, or side, of the crankcase, and allow the old and dirty oil to escape. Its lubricating properties have been in a great measure exhausted, and if replaced by fresh oil from the tank the engine benefits.

Be sure to screw the drain plug tightly home, otherwise it may work loose and fall out on the road during your next ride, with the result that the crankcase will become denuded of oil and the engine of lubrication. If at any time you have the misfortune to lose the plug use a cork, if you have nothing in the toolbag that will fit. If you fit a screw that is too long it will abut against the flywheels. The best plan is to order a new plug from the makers straight away, or get the local motor man to make you one that fits properly.

Have a look now and then at the high-tension cable, also carburettor, brake, and exhaust lifter, wires, and if any fraying is detected get it seen to as soon as you conveniently can. A soldering outfit is needed for this purpose, and it may be advisable to fit a new wire at the first opportunity.

Before leaving the machine turn off the petrol tap, close the carburettor levers and slip the belt off the rim on back wheel. When doing this raise the exhaust lifter and with the right hand grasp the lower part of the belt and pull it outwards and backwards, then, as the wheel slowly revolves, the belt will leave the rim. If the machine is fitted with a clutch of the plate or multiple-disc type, see that the engine is left "in gear"—that is, not in free engine position of the operating handle or foot pedal. Unless this is done the spring will suffer, owing to the fact that it remains, perhaps for a long time, compressed, or under load, which tends of course to take the life out of it.

Go over the tyres systematically, repairing bad cuts in the outer covers by means of a plastic composition in conjunction with the rubber solution found in the outfit. The cuts should first be well cleaned with an old tooth-brush



“ OFF WITH THE BELT.”

With the left hand raise the exhaust lifter and with the right grasp the lower part of the belt and pull it outwards and backwards, then, as the wheel slowly revolves, the belt will leave the rim.

dipped in petrol, and after this the stopping may be smeared with solution and pressed into the cuts with the blade of a knife or, better still, a splint of wood suitably shaped for the purpose.

Testing the Ignition.

If you wish to test the ignition setting of your engine you may do so by simply following the series of operations mentioned below, viz :—

- (1) Put machine on the stand.
- (2) Remove contact-breaker cover plate.
- (3) Open compression tap and pass a piece of stiff wire through into cylinder until you feel piston.

- (4) With one hand turn pulley (or pull on belt until the piston comes up on compression stroke); *both* valves will then be closed.
- (5) Note the exact moment that piston reaches dead topmost position.
- (6) With spark lever either two-thirds, or fully, retarded platinum points of contact-breaker should separate smartly as piston reaches top centre.

More advance is obtained, if required, by removing the magneto gear case and giving the pinion or gear wheel on end of the magneto armature shaft a turn equal to one tooth in the direction of rotation, or, to retard the ignition, give it one tooth in the opposite direction. In a twin-engine it is usual to carry out this procedure in relation to the rear cylinder, and when this has been correctly timed it will be found that the front one has automatically followed suit. For further explanations on these points the reader should consult the "Motor Cyclist's Handbook."

Gearing Considerations and Belt Maintenance.

To ascertain the gear ratio of your machine proceed as follows: Mark the engine pulley with a file, and also place a similar mark on the belt rim of the back wheel. Rotate the back wheel one complete revolution—after having noted precisely the positions of the two marks before commencing to do so—and carefully note how many turns the pulley makes to one of the back wheel. This will give you the ratio of gearing of your machine.

A gear of 4 or $4\frac{1}{2}$ -to-1, is suitable for a $3\frac{1}{2}$ h.-p. touring machine in ordinary country, and a rider of average weight, but for heavier riders or harder work the gear should be lowered somewhat. With a side car it should not be much, if anything, above 5-to-1. The adjustable pulley will usually permit of a gear of even $6\frac{1}{2}$ -to-1 being obtained for temporary purposes and, of course, where a two-speed or other change-gear apparatus is used much lower ratios become available.

The belt, if of leather, should be scraped and dressed occasionally, or, if of rubber, wiped over with a clean rag sprinkled, perhaps, with a drop of petrol. The fastener is all the better for a drop of oil on its joints, every now and then. Belt adjustments are more conveniently made in the

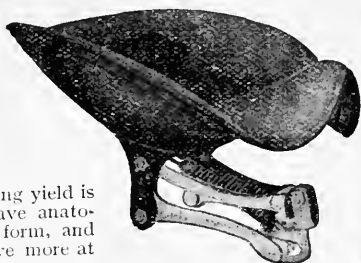
shed than on the road, although it is impossible to confine them altogether to times when one is at home.

The author hopes that what has been written in the present little treatise will be of use to the motor cycling beginner, and will be glad to hear from any reader who is in doubt upon any point which has not been made sufficiently clear in the foregoing pages. All letters bearing upon these matters should be sent to the publishers' offices addressed to "Phoenix," and accompanied by a stamped, addressed envelope for a reply

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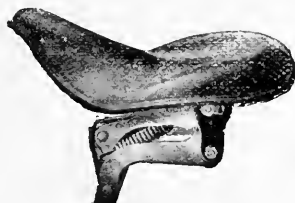
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INDEX.

	PAGE
A CCESSORIES, Motor Cycle .	77
Acetylene Lamps, Selection and Management of	75-77
Acquisition of the New Machine . .	7
Adjustable Pulleys, Purpose and Manipulation of	33, 38
Adjustments—	
Bicycle	8, 85
Engine	8, 85
Advance—Position of the Ignition Lever	11, 32
Air Lever, Manipulation of the . .	11, 21, 27, 28, 29, 30, 31, 35, 40, 41
"Air-Lock"—What it is and How to deal with it	67
B EGINNER, First Steps for the	8
Belt—	
General Treatment of the .	63, 87
Mounting on Pulleys	9
Stretching of the, and How to Correct	10, 33
Tension of the	10
Bicycle Parts, Taking Care of the	69, 84
Brakes, Motor Cycle	21, 82
"Breakdowns," The Fear of	55
C ALCIUM Carbide: Its Use in Acetylene Lamps	75
Carburettor—	
Flooding of the	10
On Fire: What to do	68
Care of the Machine, at Home . . .	89
Changing Gears: How it Should be Done	34, 38
Contact-Breaker, Magneto	58
Clothing, Motor Cyclists'	72
Clutches—	
Free Engine, Use and Misuse of	15, 35, 37, 42
Slipping, and How to Remedy .	65
Cooling the Engine, Advisability of, after Climbing	35
Corners, Driving Round	41, 42, 46
Cost of Motor Cycling, The	79
Cut-out—	
The Exhaust	43
The Magneto, or Switch	29, 35, 37

	PAGE
D IFFICULTY, The Starting	11, 15, 19, 20
Driving—	
In Traffic	40
Licence, The	14, 81
On Hills	29-39
On the Level	21, 27-29
Round Corners	41-43
With a Side Car	44-50
E NGINE—	
Adjustments	84, 85
Failures: Remedies for	56-63
Refusing to Fire: Causes and Remedies	19
Running the, Light, or on the Stand	11
Warming up the	16
Exhaust Lifter, Purpose and Manipulation of the	11, 20, 23, 28, 35, 37, 40
F AILING on Hills	32
Failures, Engine, and their Remedies	56-63
Fire, Machine on, and How to Deal with it	68
First Ride, The Beginner's	20
First Steps for the Beginner	8
Flooding of the Carburettor	10
G ARAGING Motor Cycles	82
Gas, or Throttle Lever, Manipulation of the	11, 17, 21-23, 27-31, 35, 40
Gear: Ratios for Motor Cycles . .	49, 87
Gears, Variable or Change Speed, Uses of	30, 34, 38
H ANDLE Starting, Hints on	11, 13
Hill-climbing—	
On a Motor Cycle	29-39
Some Aids to	34
Hills, Failure on, and What to do	33, 34
I GNITION, (or Spark) Lever, Position of the	11, 32
Ignition, Testing the Setting of the	86
Injecting, Paraffin or Petrol at Starting	13, 20

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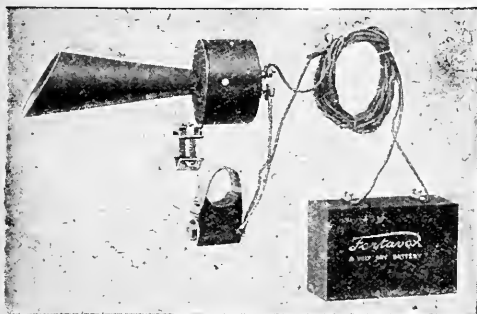
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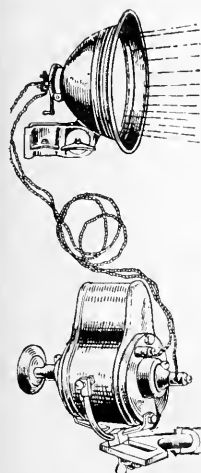
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	PAGE
J ACKING the Machine up on the Stand, Need for Care when	8
Jet, the Carburettor	19, 22, 33, 63

"K NOCKING " in the Engine : Its Causes and Effect	31, 37, 41
---	------------

L AMPS, Selection and Management of Acetylene ...	75-77
Law, Motor Cycle	14, 81
Legal Obligations, The Motor Cyclist's	14, 81
Level Roads, Driving on	27
Lever—	
How to Manipulate the	10
Setting of the, After Starting	21, 27
Setting of the, When Hill-Climbing	31
Licence—	
The Driving	14
The Inland Revenue, or Local Taxation.....	14
Lubrication of the Engine	51-53
Luggage, Carrying on Motor Cycles	78

M ACHINE—	
Acquisition of the New	7
Care of the, at Home.....	84
Mounting the	15
Overhauling the, Before a Ride	79
Magneto—	
Cut-out Switch	29, 35, 37
Faults Connected with the	19, 58
Manipulation of the Levers	10
Misfiring: Its Causes and Remedies	57-59
Motor Cycling, Cost of	79
Mount, The " Running ".....	15
Mounting the Machine, Different Styles of	15

N EW Machine, Acquisition of the.....	7
--	---

O IL (Engine): How to Buy and Use it	53
Overhauling the Engine and Machine at Home	79

	PAGE
P ARAFFIN (or Petrol) Injections at Starting	13, 20
Petrol—	
Pipe Leaking: Remedy for..	66
Running Short of	65
Storage of	53
Pulleys, Mounting the Belt on the	9

R AILWAY, The Carriage of Motor Cycles by.....	83
Registering the Motor Cycle.....	14
Repairers, Motor Cycle.....	82
Ride, The Beginner's First.....	20
Road Signs and Their Meanings..	24
Rule of the Road for Motor Cyclists	24
" Runabout " Types of Machine, The	50
" Running " Mount, Objections to the	15

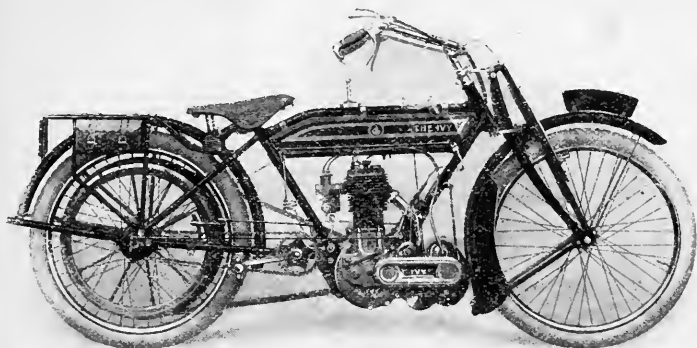
S ADDLES, Need for Good, on Motor Cycles	77
Side Car—	
Alignment of	46-49
Taking Corners with a	46
Side Cars, Their Advantages and Characteristics	44
Spark (or Ignition) Lever, Position of the	11, 32
Sparkling Plug, How to Test the..	58
Speed Limits, Observation of the	24
Start, How to Make an Easy	13
Starting—	
Free Engine Method of.....	15
Handle Method of	13
Pedalling Gear for.....	11
Switch, Magneto Cut-out, Object and Use of the	29, 35, 37

T ENSION of the Driving Belt	10
Throttle Lever, Manipulation of the	11, 17, 21-23, 27-31, 35-40
Timing Gears, Accidents to Engine	67
Tool Kit, The, What it Should Contain	73
Traffic, Riding Motor Cycles in ..	40
Tyres, The Important Question of	70-72

V ARIABLE Gears on Motor Cycles, Uses of.....	30, 34, 38
--	------------

W ARMING up the Engine: Why and When Necessary	16
---	----

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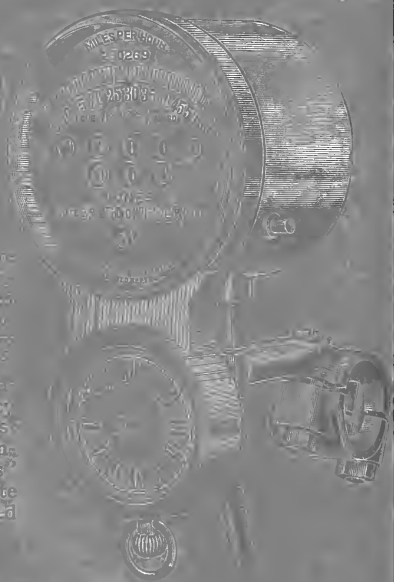
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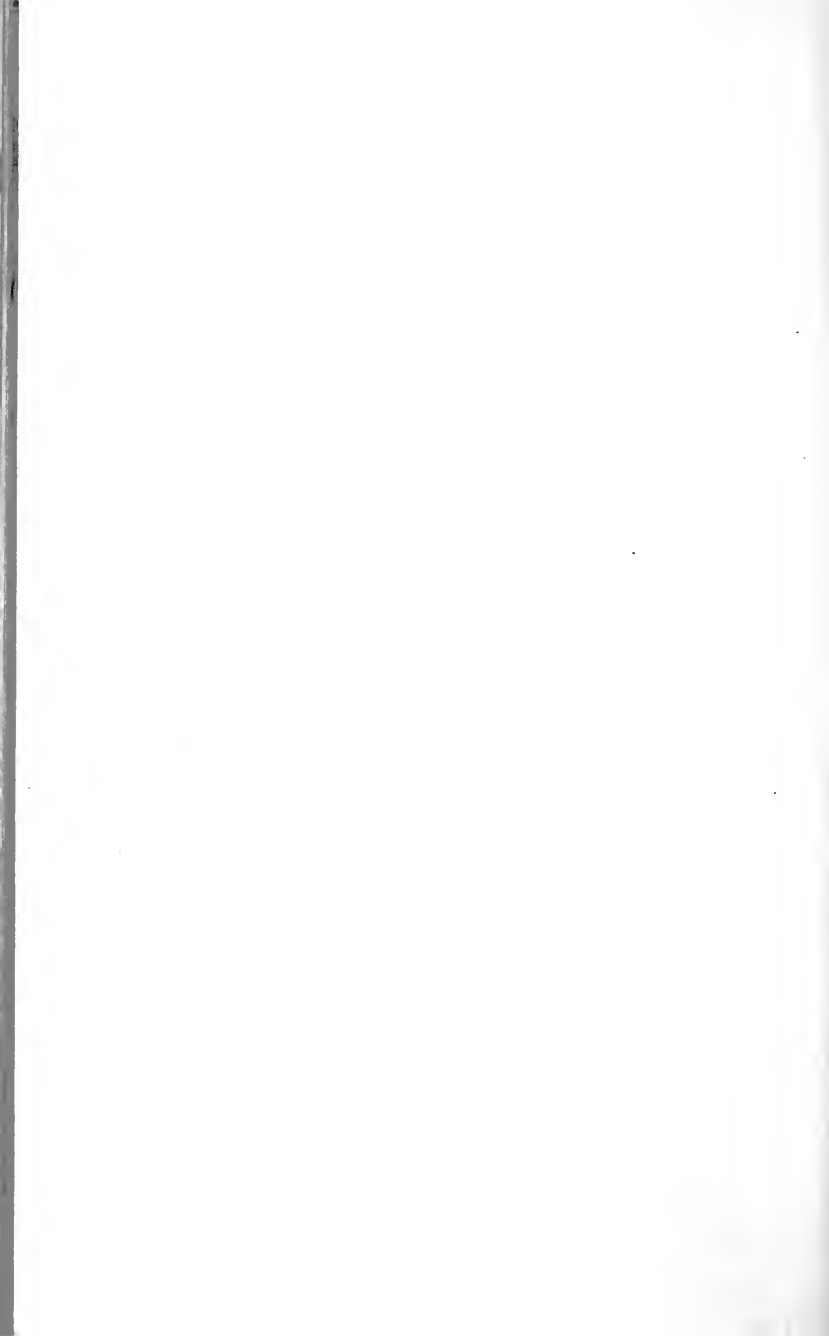
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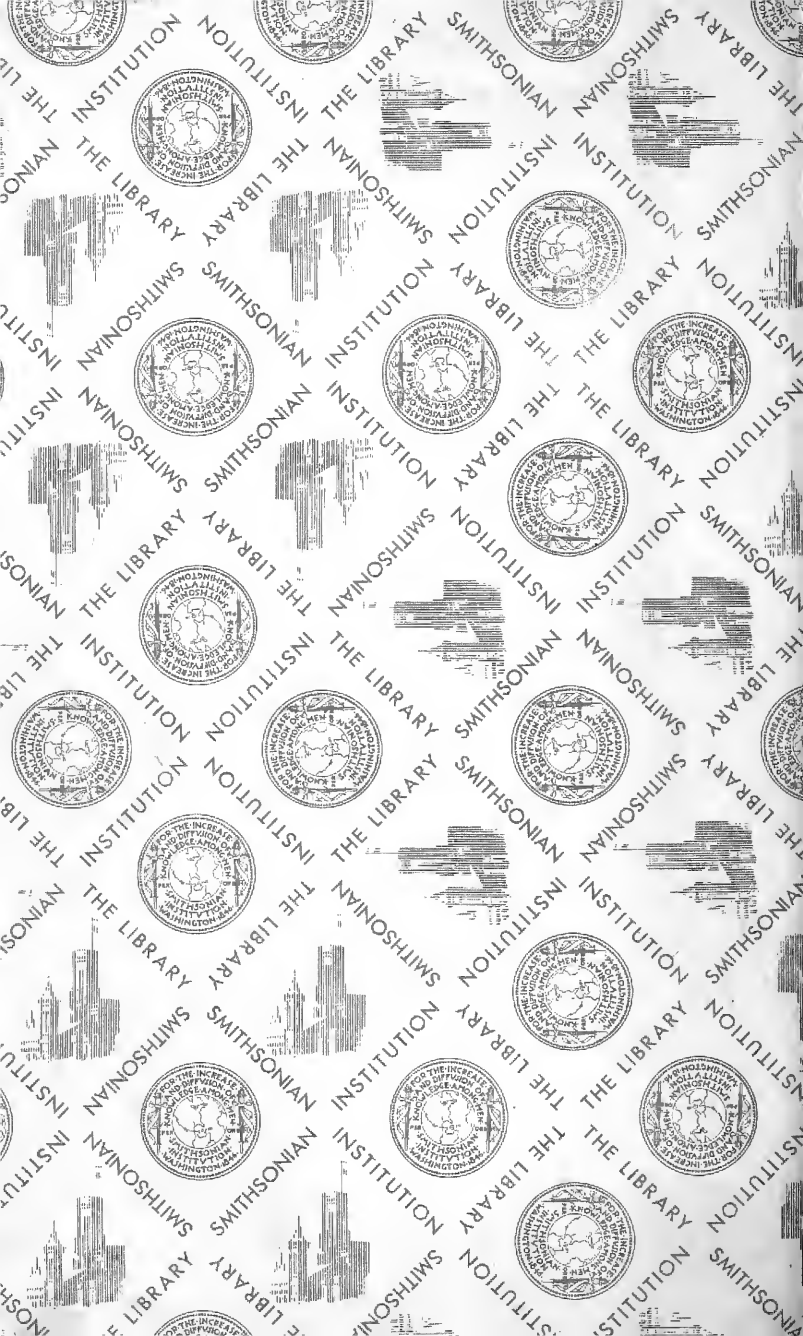
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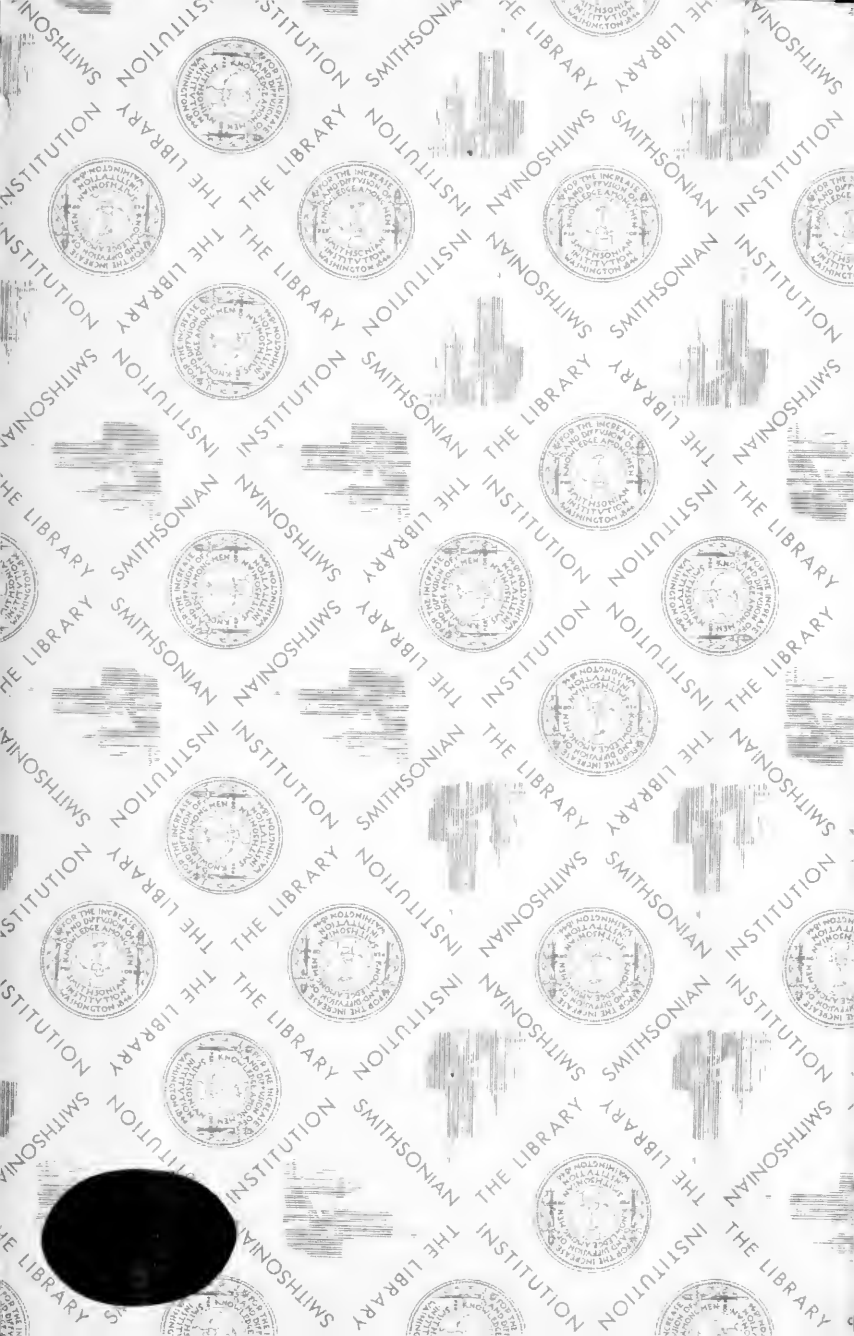
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